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IO1 Report on Co-creation Workshop

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Contents

1. Introduction

The present document, developed in the framework of the TRUST project stands for the delivery of Intellectual Output 1 (IO1: Report on Co-creation workshop) and provides all partners the basis for the development of the new professional profile (European Destructive Testing Technician (EDTT), its qualification standard and training courses as well as other relevant outcomes to be used for the implementation of the qualification at both national and European level. In fact, the Report also includes a comparative analysis between partners' countries regarding national qualification framework (NQF) and European qualification framework (EQF) to find out the current state of art for enabling the implementation. Partners will be able to know what industry needs to tackle, what skills to address and how EDTT qualification can be developed to address those needs. Despite the generalized feeling that a new qualification on destructive tests of welded joints is needed, measures were undertaken in order to collect relevant information that would allow the working group to identify specific needs the new qualification should address.

All partners have been involved in all activities carried out in the scope of IO1 and for elaborating the national and transnational reports and overcome the above-mentioned challenges. Specifically, partners are listed as follows:

- Institutul National de Cercetare Dezvoltare in Sudura si Incercari de Materiale - ISIM Timisoara, Romania
- European Federation for Welding, Joining and Cutting, Belgium
- Instituto de Soldadura e Qualidade, Portugal
- Istituto Italiano della Saldatura – Ente Morale, Italy
- Łukasiewicz Research Network - Institute of Welding, Poland.

Since the European Federation for Welding, Joining and Cutting, Belgium acts as representative for welding and material testing community in Europe, the countries involved in the survey are not restricted to their base country (Belgium), but to a broader European area.

This report is divided into five main sections, namely the scope and objectives of the study, methodology undertaken, implementation in NQF and EQF systems, presentation of results collected from the surveys and national workshop from VET providers first and then from Industry and final summary and discussion.

2. Scope and objectives

The scope of this study is to investigate about the actual need for the European Destructive Testing Technician (EDTT) qualification in Europe and draft the route forward for its implementation. In order to target this scope, the examination of the current scenario and gaps, evaluated within a randomly selected group of attendants, among different industrial sectors and VET representatives was conducted.

The main objectives targeted within the present report are:

- Understand the role and common day-to-day activities of those professionals performing destructive tests for defining the professional profile of the European Destructive Testing Technician;
- Identify current mismatches between the technical requirements of the function, per sector of activity and per material being tested, and the average set of skills of the personnel working in destructive testing;
- Determine the requirements the new qualification needs to include, in order to deliver a highly effective professional education path;
- Develop a deeper understanding on the feasibility and route forward for introducing the DT qualification path.

3. Methodology

The present report, elaborated the context of the TRUST project *Intellectual Output (IO) 1 – Report on Co-Creation Workshop*, was developed starting from the information that partners have collected at national level from two main sources:

- Answers given by VET providers and industry representatives to prior developed questionnaires formulated by partners;
- Co-creation national workshops ; conducted by each partner at national level. EWF has extended the workshop to its broader European community.

Results in the document are presented by adopting histograms, in order to make the reader to benefit from the effectiveness of graphical impact. Since histograms indicate percentage, a premise is made regarding the number of answers collected. For instance, when a percentage is expressed (e.g., the 5% answered “NO”), it does not represent a percentage of the whole country where the survey was undertaken but just the percentage of the applicants to the questionnaire.

In order to implement the study , the following steps were conducted:

- Partners first identified the most relevant topics to be investigated, in cooperation with the various stakeholders;
- Partners developed a questionnaire, made of two parts, which were respectively specific for training centres (VET providers) and for professionals working in DT;
- Later such questionnaire was submitted to representatives of training centres (VET stakeholders) and industry representatives asking for feedback. Both categories of stakeholders provided feedback;
- A structure for national workshop approach and for outcome reporting was developed;
- Subsequently, national workshops were conducted by each partner; within the workshop the results of the surveys were discussed, and the various challenges were explored and clarified;

- Results from national workshop were shared, collected and put together into the present document.

Due to the restrictions raised from the COVID-19 pandemic scenario, national workshops were conducted online. The methodology for delivering the workshop was in line with the World Café approach, trying to implement as far as it was actually feasible online, the main guidelines produced by partners themselves in advance.

Each workshop lasted 2.30 hours and consisted of four fundamental phases:

- In the first phase, lasting 20 minutes, participants listened in a group to a presentation on the purpose, objectives and implementation of the TRUST project;
- In the second phase, lasting 20 minutes, participants listened as a group to the answers that have been collected in the surveys;
- In the third phase, lasting 80 minutes, participants actively contributed to the workshop through the WORLD Café METHOD modality;
- The ideas of the conversation were analysed by the three moderators and shared with the participants for any further comments and observations.

With regard to the third phase, the fundamental rules and contents in which discussion was articulated are provided below.

The workshop was conducted by dividing the participants into three different tables, each of which was oriented to constructively respond to an open question, posed by the moderator, in order to stimulate a constructive dialogue.

The selection of how to divide the working groups was done by making sure to create mixed groups, so that each group contains at least one representative per category, i.e. at least one VET provider and at least one industrial representative.

Each session held at each table, which corresponds to a macro question set out below, lasted 15 minutes. At the end of the 15 minutes, a 10-minute break was established, in which the participants were free to rest, while the moderators analysed and collect the main ideas that emerged from the conversation.

Subsequently, the participants at each table moved to the next table to engage in a new discussion.

The second and third sessions had a duration of 20 minutes each, 5 minutes more, in order to make sure that the conversation could start, with the moderator who explains to the participants what has been deduced from the answers of the previous participants at that same table.

The three macro questions proposed, matured from the questions asked in the surveys previously carried out, were the following:

1. What are the current industrial needs in developing a professional profile for destructive test technicians and, therefore, what are the main gaps on which to build

the need to develop a profile of this type and which a company path would not be able to fill?

2. How do you think the overlaps between training activities and the needs arising from the performance of operational activities can be resolved effectively for the company and for the worker?

3. In terms of technical and non-technical knowledge, what do you think could be, in order to fill industrial needs, the skills that the worker will have to possess at the end of this qualification path?

Partners collected the feedbacks and reported as outcome of the national reports to be included in the present document for analysis of results and discussion.

4. EQF and NQF levels in the different counties

The European Qualifications Framework (EQF)[1], implemented in 2008 and later revised in 2017, is a common European reference system linking different countries National Qualifications Systems (NQF) and frameworks together.

The EQF is an 8-level, learning outcomes-based framework for all types of qualifications that serves as a translation tool between different national qualifications frameworks. This framework helps improve transparency, comparability and portability of people's qualifications and makes it possible to compare qualifications from different countries and institutions.

The EQF covers all types and all levels of qualifications, and the use of learning outcomes makes it clear what a person knows, understands and is able to do. The level increases according to the level of proficiency: level 1 is the lowest and level 8 the highest level. Most importantly, the EQF is closely linked to national qualification frameworks. This way it can provide a comprehensive map of all types and levels of qualifications in Europe, which are increasingly accessible through qualification databases.

EQF is structured in eight qualification levels where each level is defined by a set of descriptors indicating the learning outcomes relevant to qualifications at that level in any system of qualifications.
The eight levels cover the entire span of qualifications from those achieved at the end of compulsory education to those awarded at the highest level of academic and professional or vocational education and training. They are described in terms of level descriptors for the expected knowledge, skills and attitudes (responsibility and autonomy) for each level of qualification.

The learning outcomes descriptors, for all levels of qualification, are defined in terms of knowledge, skills and attitudes (responsibility and autonomy) as shown in the following table:

[1] https://europa.eu/europass/en/european-qualifications-framework-eqf

KNOWLEDGE	SKILLS	ATTITUDES (RESPONSIBILITY AND AUTONOMY)
In the context of EQF, knowledge is described as theoretical and/or factual.	In the context of EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments).	In the context of the EQF responsibility and autonomy is described as the ability of the learner to apply knowledge and skills autonomously and with responsibility.

Table 4.1. Brief description of the knowledge, the skills and the attitudes in the context of EQF, source: https://ec.europa.eu/ploteus/content/descriptors-page

4.1. National qualification framework (NQF)

The table below shows the corresponding NQF in countries of this partnership to the EQF levels; the EDTT qualification is aligned with EQF level 4, hence it is highlighted in the following table.

	COUNTRIES' NQF				
	BELGIUM	ITALY	POLAND	PORTUGAL	ROMANIA
EQF LEVELS		IT QNQ	PRK	PT QNQ	CRC
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8

Table 4.1.1. EQF and NQF Frameworks Correspondence in the countries of TRUST Partnership; note the EDTT qualification is aligned with EQF level 4, therefore hence it is highlighted in bold.

4.2. Belgium national qualification framework (NQF)[2]

Belgium is comprised of three Communities: the French, the Flemish and the German-Speaking Community. The establishment of these Communities was based on culture and language factors, with impact on the way Education was and continues to be organised.
Since January 1989 (when the federalisation of the State occurred) all responsibilities related to Education were transferred to the Communities, leaving only the setting of the beginning and end of compulsory schooling, the minimal conditions for awarding diplomas and the pension scheme as federal responsibilities.

[2] https://eacea.ec.europa.eu/national-policies/eurydice/content/historical-development-5_en

In Belgium, education is compulsory from 6 to 18 years old and students are free to attend school from home (e-learning, which offers interactive online course modules to prepare them for certification exams).
Education and training organised by the government is considered as "official education", whereas education and training organised but a private person is known as "free education", and do not receive funding from the government.
These are the stages of the education system in Belgium:

a. Compulsory education: students must attend compulsory education until the age of 15, when they may attend school in part-time or choose a learning path that combines part-time vocational education with part-time employment;
b. Primary education: it comprises pre-school (accessible to children until the age of 6) and primary school (for children from 6 to 12 years old)education. Primary education has six subsequent school years and when successfully completing it, children are granted a certificate;
c. Secondary education: it is aimed at young people aged 12 to 18 and contains three stages and various types of education. Each stage has two grades: in the third stage of vocational secondary education, students are only able to obtain a certificate of upper secondary education (which grants unrestricted access to higher education) if they successfully complete a third grade.
   In the French Community, education takes different forms (general, technical, artistic and vocational) and two streams: transition stream (general education, prepares students for higher education and also offers them the opportunity to enter the labour market) and qualification stream (vocational education, prepares students to enter the labour market while enabling them to continue their studies in higher education). Technical and artistic education can be organised in the transition or in the qualification streams.
d. System of alternating learning and working students that take part-time education are obliged to take part in learning and working for at least 28 hours a week. In the French Community, in a Centre for Dual Vocational Education (or CEFA), students take classes for 15 hours a week, supplemented with working experience, aligned with the programme. Students can obtain the same certificates and qualifications as in the usual full-time qualification stream education. In addition, the apprenticeships are organized by IFAPME (the Walloon Institute of Dual Vocational Education and Training for Small and Medium-Sized Enterprises) and the SFPME (Small and Mid-Sized Companies Training Service in the Brussels-Capital Region), institutions that organize dual vocational courses that satisfy the requirements of compulsory schooling.
e. Higher education (HE): in Belgium, HE contains programs which result in three possible degrees:
   - Bachelor (may be both professionally and academically oriented, aiming to offer access to a master programme or to the labour market. In general, it lasts 3 years – 180 credits);
   - Master (focused on advanced scientific or artistic knowledge or competences required to practice science of arts or for practicing a profession. It lasts 2 years (120 credits) and is rounded off by a master thesis);
   - Doctor.

Higher dual vocational education is also part of this level in the French Community, in which the skills needed to obtain a degree from a HE institution are acquired in workplace and in training.

Lifelong learning is also promoted in Belgium through part-time education in arts and adult education. The later allows participants to obtain a recognised diploma, qualification or certificate.

4.3. Italy national qualification framework (NQF)[3]

In 2005, the Ministers of Higher Education of the Bologna Process signatory countries decided to develop the Qualifications Framework for the European Higher Education Area - QF for the EHEA. The Framework comprises the three main cycles of Higher Education, as defined by the Bologna Process, and offers an overview of all qualifications awarded at the end of each cycle, with reference to the number of ECTS credits collected and to the learning outcomes according to the Dublin Descriptors. The Qualifications Framework for the European Higher Education Area is aimed at facilitating the correct understanding and comparability of qualifications in the higher education systems of each country. A further aim of the framework is to offer a comprehensive overview of the European teaching and learning offer, targeted at students coming from all over the world. Each country committed to putting together a National Qualifications Framework – NQF which is compatible with the Qualifications Framework for the European Higher Education Area.

In 2005, the Italian Ministry of Education, University and Research (MIUR) started working on the Italian Qualifications Framework, in compliance with the procedures established at European level. CIMEA was tasked with producing the first prototype model of the National Framework and, after a process of national consultation, the Italian Qualifications Framework – QTI was published in 2010.

Since 2012, CIMEA has been a participant in the work of the National Correspondents for Qualifications Frameworks (QF-EHEA) group, created at the Council of Europe, representing Italy.

4.4. Poland national qualification framework (NQF)[4]

The modernisation of Polish qualifications initiated by the adoption of the Act of 22 December 2015 on the Integrated Qualification System (e.g., Journal of Laws 2018, item 2153 and 2245) is based on the adoption of common rules for qualifications operating in different areas. The integrated system consists, on the one hand of those elements that are already functioning in Polish social and economic life, and on the other hand, of new instruments that enable the effective integration of the whole system, the most important of which are the Polish Qualifications Framework (PRK) and the Integrated Qualifications Register (ZRK), which includes all qualifications included in the integrated system. All qualifications included in the integrated system are also assigned a Polish Qualification Framework level (PRK level). The

[3] http://www.cimea.it/en/services/qualifications-framework/qf-ehea.aspx

PRK, like the European Qualifications Framework (EQF), distinguishes eight levels of qualifications. Each level of the PRK has been characterised by general statements of the learning outcomes required for a given level of qualification. For the purposes of defining a PRK level It is irrelevant for the definition of a PRK level whether the learning outcomes required for a qualification are achieved in organised education or in a different way.
A unique Polish solution in the PRK is the two-tier level characteristics. Level 1 (universal) characteristics apply to all types of education. They constitute an annex to the Act on the Integrated Qualification System. They are further developed into level characteristics of the second level:

- Characteristics typical for qualifications of a general nature,
- Characteristics typical of qualifications awarded after obtaining a full qualification at level 4,
- Characteristics typical of qualifications awarded as part of higher education,
- Characteristics typical of qualifications of a professional nature,

The first and second level characteristics should be read together.

4.5. Portugal national qualification framework (NQF)[5]

The Portuguese education and training system have undergone several major reforms, highlighting here the Agenda for the reform of Vocational Training in 2007. This led to the development of a national qualifications system, whose main aim was to promote widespread attainment of secondary education as a minimum level of qualification.
The comprehensive Portuguese qualifications framework6 (Quadro Nacional de Qualificações - QNQ) is a single reference for classifying all qualifications awarded in the Portuguese education and training system. Established by Decree Law No 396/2007, the framework was published in 2009 and came into force in October 2010. It includes eight levels, with level descriptors defined in terms of learning outcomes.
The creation of the NQF, which was undertaken as part of the Education and Training System reform process and the creation of the National Qualifications System, was based on the following assumptions:

- The need to integrate and coordinate qualifications obtained within the different subsystems of education and training (education, vocational training, higher education) within a single framework;
- The importance of valuing and considering competences acquired in non-formal and informal contexts;
- Improved legibility, transparency and comparability of qualifications;
- Valuing dual certification particularly associated with upper-secondary qualifications;
- Ensuring the coordination with European Qualifications Framework, which involves the use of the EQF as a reference tool to compare the qualifications levels of different qualifications systems, in terms of lifelong learning.

The options taken regarding the design and structure of the Portuguese NQF are in response to the following aspects:

[5] https://eacea.ec.europa.eu/national-policies/eurydice/content/national-qualifications-framework-60_en
[6] https://www.cedefop.europa.eu/files/portugal_-_european_inventory_on_nqf_2016.pdf

- The NQF includes qualifications at various levels of the education and training system, regardless of entry points (primary, upper-secondary, higher education, vocational education and training and processes of recognition, validation and certification of competences, acquired both formally and informally);
- Divided into 8 qualification levels that include all the qualifications currently produced in the Portuguese education and training system;
- The adoption of a methodology based on learning outcomes to describe each qualification level: the use of learning outcomes in defining qualification levels reflects a major change in the way qualifications are conceptualised and described, making comparability possible according to competences and not learning processes;
- The adoption of the "knowledge, skills and attitudes" fields for the definition of learning outcomes for each qualification level;
- The adoption of descriptors of learning outcomes found in the EQF.

4.6. Romania national qualification framework (NQF)

In 2013, Romania adopted a learning outcomes-based national qualification framework (NQF) for lifelong learning – the Romanian national qualifications framework (ROQF) – by Government Decision No 918/2013. This aims to bring together nationally recognised qualifications from initial and continuing vocational education and training (CVET), apprenticeship, general and higher education, and to help integrate the validation of non-formal learning into the national qualifications system.

The Ministry of Education is the national authority for formal pre-university education (including IVET) and higher education. The ministry is responsible for IVET policies which are developed by the National Centre for Technical and Vocational Education and Training Development (CNDIPT). Sectoral committees are responsible for defining and validating occupational standards and qualifications. VET participation in Romania is above the EU average and initial reforms included the introduction of a competence-based curriculum in primary and secondary education and training of teachers on how to use the curriculum. In 2016, the dual form of initial VET at EQF levels 3, 4 and 5 was introduced, and in 2018 the dual system was endorsed by amendments to the education law. The implementation of dual VET started in 2017/18 and is currently available only at EQF level 3. Regarding the technical fields, at the upper secondary level, in Romania there are two main types of VET programmes:

- Three-year school-based programmes that provide graduates with a professional qualification at EQF level 3. Programmes are offered by „professional schools". WBL is offered in schools at an average of 50% per programme, while the share of learners in dual VET system is 1.5% of the total VET learners.

- Four-year technological programmes that offer graduated the EQF level 4 „technician qualification". The programmes are provided by technological high schools and sometimes by colleges and the WBL share is 25%.

Currently, the VET system in Romania faces the following challenges:

- Low level of performance of students forms primary and secondary education, among others, being partially attributed to educational factors (teaching and curricula);
- Few investments to support the institutional development of education and training;
- Unequal access to education and training and high rate of abandon;
- Youth unemployment;
- The lowest participation in lifelong learning in the EU;
- Low attractiveness in VET.

As a response to the existing challenges, CNDIPT introduced the dual form as part of initial VET, also the VET strategy 2016-20 aims states that by 2020, the Romanian vocational education and training system will meet the demands of the labour market and the needs of the direct beneficiaries, by making use of human resources' competences and skills. This target was only partially reached.

4.7. The European Qualifications Framework (EQF) and EWF Proficiency Levels

As previously mentioned, EQF is an 8-level learning outcome-based framework that covers all types and levels of qualification (from Vocational Education and Training to Higher Education). It is a tool that translates and allows to compare different national qualifications frameworks and their correspondence to the EQF, which helps to improve transparency, comparability and portability of people's qualifications, and makes it possible to compare qualifications from different countries and institutions. This way, the EQF, provides a comprehensive map of all types and levels of qualifications in Europe, which are increasingly accessible through qualification databases.
Each EQF level increases according to the level of proficiency (e.g., what a person knows, understands and is able to do), being level 1 the lowest and 8 the highest.
EWF Qualification System for Welding and related technologies (of which the European Destructive Testing Technician qualification will be part as a way to ensure its sustainability and exploitation beyond TRUST project) assures harmonized knowledge, skills, autonomy and responsibility for any holder of a diploma, in any region of the world. It comprises Education, Examination and Qualification Guidelines for different professional/proficiency levels.
For that purpose, EWF Qualification System has its own reference framework, containing six different proficiency levels ranging from Elementary (comparable to EQF level 2) to Expert (comparable to EQF level 7), currently organized in statements of general descriptors and defined in terms of knowledge, skills, autonomy and responsibility for each proficiency level that its qualifications encompass. Those descriptors are the same as the ones used to describe EQF levels (see Appendixes).
This approach ensures EWF qualifications' transparency, recognition and linkage to both National (NQF) and European Qualifications Frameworks (EQF), as well as their recognition by Industry at European level.

5. Assessment of Vocational, Education and Training (VET) centres insights for the definition of a new Destructive Testing (DT) technician qualification path

In this paragraph the results collected from the analysis of the answers to the questionnaire reported in appendix 8 are described; each figure/image or graph is ascribed to a caption were the number of the question of the questionnaire is reported together with a general description. Note the absolute numbers of responses per country can be found in the TRUST IO overall feedback table of results reported in appendix 8.

5.1. Current demand

Figure 1 shows the results collected regarding the requests received from VET centres for the provision of courses on destructive controls. It can be seen that, in each country, the centres are divided approximately equally between those who receive requests and those who do not receive any requests. It can therefore be attested that about half of the centres interviewed have developed a basic familiarity with the training request.

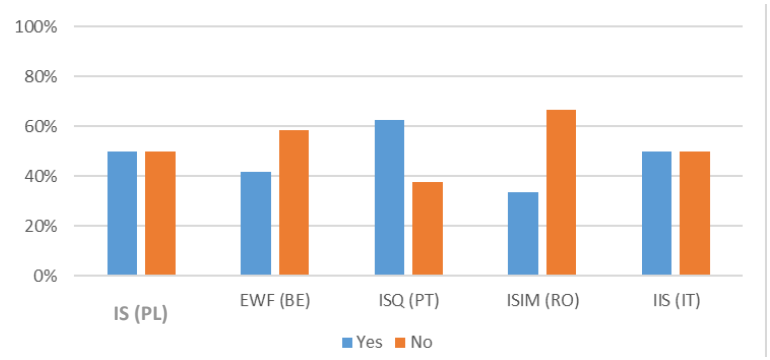

Fig. 1. Occurrence of requests for courses in DT (Questions for VET providers - question #1).

Figure 2 shows, in the case of a VET centre that has already received requests, the frequency with which these centres receive requests for training within the DT. The number of requests is limited to a maximum of 10 requests per month and rarely exceeds this threshold. The results recorded by IS and EWF are the most oriented towards a lower number of requests that never exceed 5 requests per month. ISQ recorded, in percentual terms, the highest request which, for some centres, exceeds 10 requests per month.

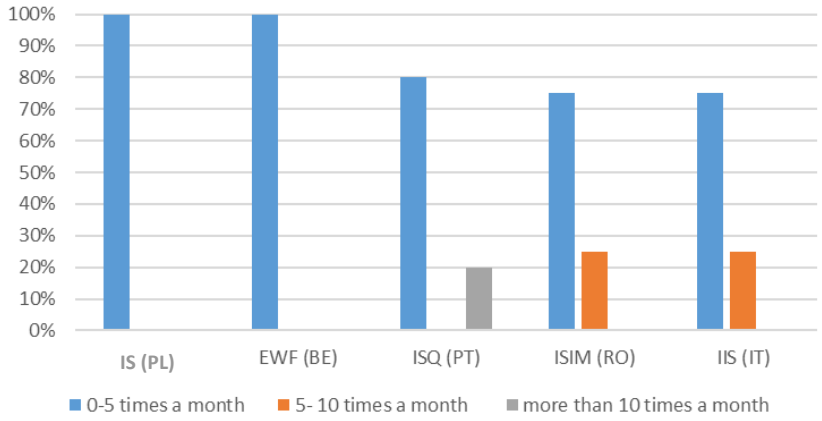

Fig. 2. Frequency of demand for training (Questions for VET providers - question #2 a).

Figure 3 describes which sectors, in the various countries, have the greatest demand for training for DT. It can be noted that IS and ISIM have registered a more homogeneous demand in the various sectors, while ISQ, EWF and IIS have found the predominance of some sectors. In particular, EWF has identified a greater demand in the Construction, Energy and Automotive sectors; ISQ confirms the results of EWF, but with significant values also from the Aerospace sector. IIS has registered more requests from the transport sector.

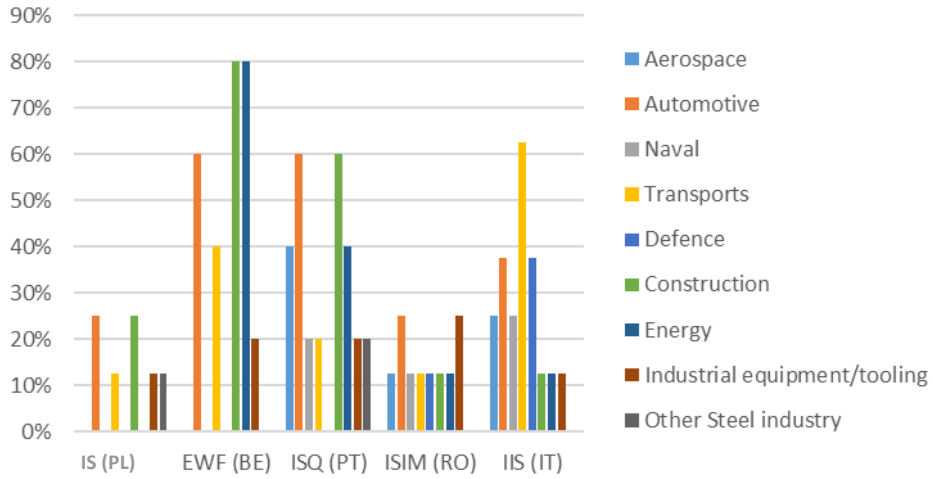

Fig. 3. Sectors asking for DT courses (Questions for VET providers - question #4).

Figure 4 shows the age of applicants for a DT course. IS and EWF registered, in percentual terms, the participation of older workers since none of the interviewed VET contributors described an average age of the participants below 25. IIS identified the largest percentage of young subjects applying for the courses. As for ISQ and ISIM, the distribution by age is rather homogeneous.

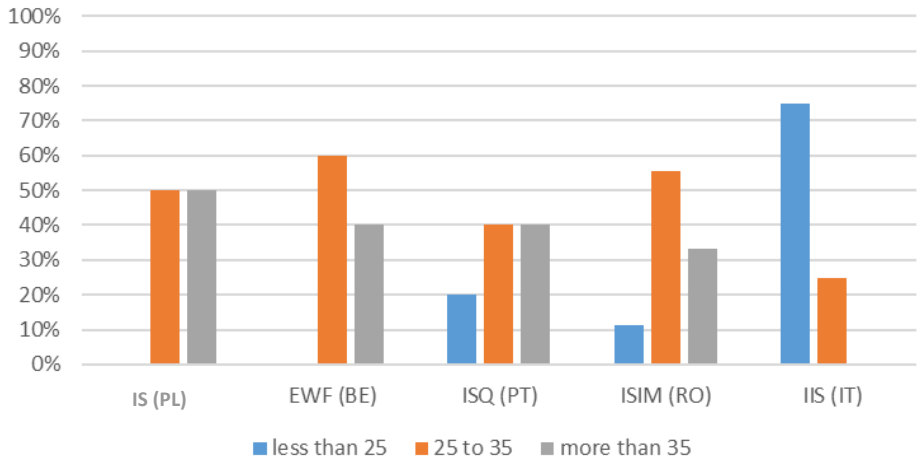

Fig. 4. Average age of applicants (Questions for VET providers - question #2 b).

Figure 5 shows the educational background of the course applicants. It can be noted that, in all the countries examined, most of the requests are from persons with an EQF 4 education level. ISIM and IIS reported that the average education level is low and never exceeds EQF 5, showing that the profession is pursued above all by workers with a lower level of education. IS recorded the highest level of education in applications.

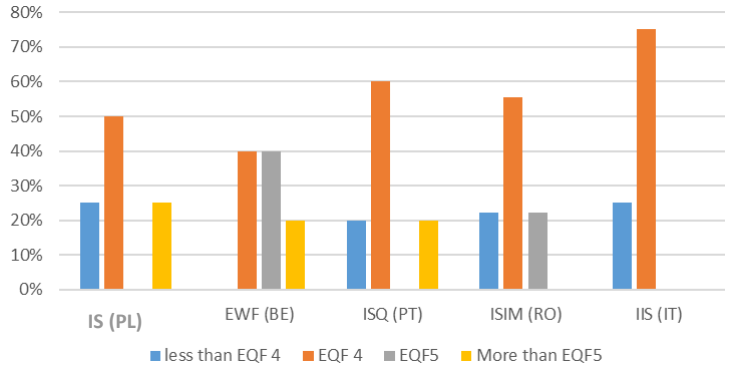

Fig. 5. Current educational background of applicants (Questions for VET providers - question #2 c).

The following table includes some further relevant comments collected during the national workshops.

PARTNER	COMMENTS
Institutul National de Cercetare Dezvoltare in Sudura si Incercari de Materiale - ISIM Timisoara, Romania	4 in 8 VET suppliers refer having a demand for training in Destructive Testing (DT). Of these, 75% (3) refer receiving up to 2 requests a month and one for more than 6 requests a month.
European Federation for Welding, Joining and Cutting, Belgium	There is a bigger need for theoretical training in a qualification for Destructive Testing since the majority of professionals who perform this type of testing learn how to do it in the field with more experienced professionals (who also learn to do it in the field, by experience), but do not have sufficient theory to support their actions, so they need their work to be supervised by professionals with higher education levels. The entry level for the qualification for Destructive Testing Technician needs to consider that a lot of professionals already perform this type of testing in the field without the qualification, so RPL should be a route to be implemented. The CUs for the qualification for Destructive Testing Technician need to be structured in accordance with the sectors that have a bigger need for this type of qualification, since there are different processes for each material.
Instituto de Soldadura e Qualidade, Portugal	5 in 8 VET suppliers refer having a demand for training in Destructive Testing (DT). Of these, 80% (4) refer receiving up to 5 requests a month and one more than 10 requests a month. As for the profile of the applicants, the majority of them are over 25 years old and have an EQF level 4 qualification.
Istituto Italiano della Saldatura – Ente Morale, Italy	The demand for education exists, but it is really oriented by employers' needs. Technicians working in the DT field would enjoy a training path in line with the proposed EDTT, but employers would struggle to continuing production activities with a lack of personnel dedicated to being part of the EDTT educational path.
Łukasiewicz Research Network - Institute of Welding, Poland	4 out of 8 VET providers admitted they have demand for Destructive Testing course. All of them refer receiving 5 or less requests per month. Profile of applicants is as follows: half of them is aged between 25 and 35 years old while the other half is older than 35. As for their educational background, majority of applicants have an EQF level 4 or higher.

Table 5.1.1 – Comments taken from the national workshops conducted from each partner about the current demand.

5.2. Entry requirements

Figure 6 shows the level of education that VET centres suggest as the minimum EQF level to guarantee a successful learning by course participants for DT. For all partners except EWF, there was a majority of VET centres which stated that the minimum requirement for participation should be EQF 4. This trend is more pronounced in the data collected by ISQ and IIS. EWF has seen a trend towards a minimum requirement of EQF 5, with a higher level of education suggested. Furthermore, the VET centres interviewed by IS, ISIM and IIS do not recommend opening the possibility of enrolment to participants with an EQF lower than 4. Rarely, in the various countries, is a minimum requirement of an EQF level 6 recommended, as , generally considered too prohibitive,

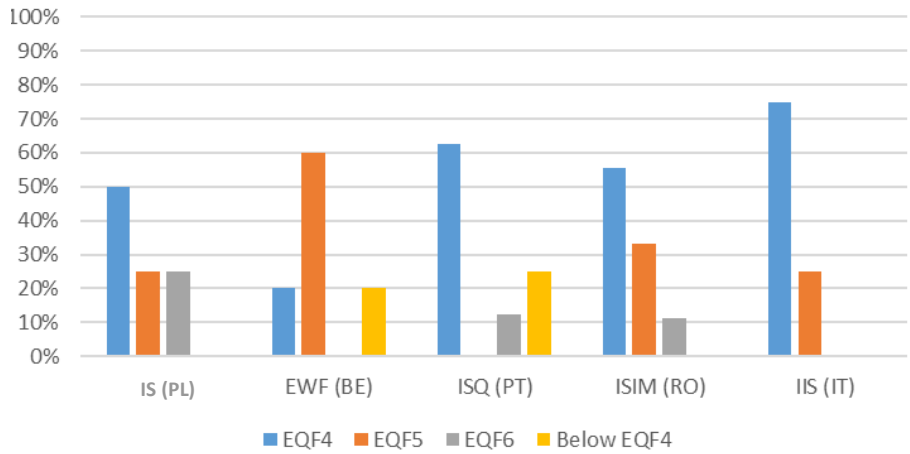

Fig. 6. Advised minimum education entry requirements (Questions for VET providers - question #3 a).

Figure 7 gives an indication of the minimum professional experience to have to attend the course, based on the suggestions expressed by the VET contributors.

It is noted that a high level of experience is not required for IS respondents, while ISQ respondents have shown a greater belief that a substantial level of professional experience, greater than 3 years, is recommended to participate effectively. . The trend recorded by EWF, ISIM and IIS is similar to that recorded by IS, with the exception of the way in which enrolment is perceived by workers with no previous experience in the subject. According to the data reported by IS and ISQ, there is a large acceptance of inexperienced workers.

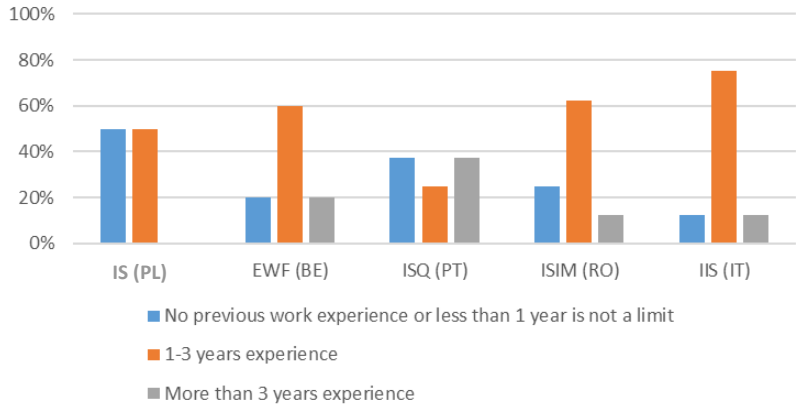

Fig. 7. Advised minimum working experience (Questions for VET providers - question #3 b).

Figure 8 shows the technical and non-technical skills that VET centres recommend possessing in order to participate in the course effectively. According to the data reported by all the institutes, it was agreed that it is essential to have knowledge in the field of materials science and engineering, as well as, albeit to a lesser extent, a basic knowledge of English. The third skill element that is recognized as being important is ITC systems at the entry level. Furthermore, the data reported by ISQ give importance to an advanced knowledge of English, rather than a basic one. This was a bit more explored in the workshop and the experts referred that Technical English should be even more valorised than Advanced English. All partners reported little interest from VET centres in prior knowledge of advanced ITC systems.

EWF reported that the majority of results obtained in the survey are for entry EQF level 5, because the trainers want the trainees to have as higher an education as possible when they enter their courses.

The workshop participants mentioned that the trainee should have:

- At least basic knowledge in welding before entering this qualification;
- Between 1- 3 years working experience in working with testing;
- Vision inspection/visual evaluation knowledge (according to ISO 9712)

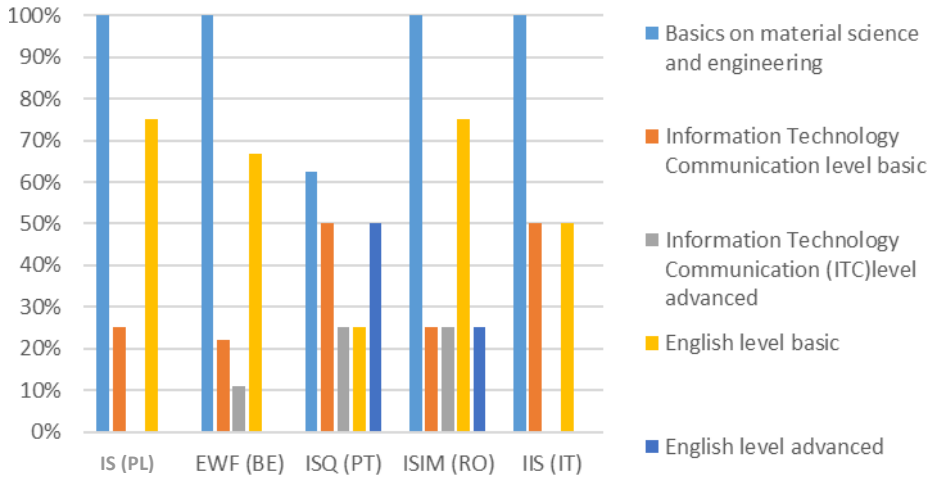

Fig. 8. Advised starting skillset (Questions for VET providers - question #11).

The entry level for the qualification for Destructive Testing Technician needs to consider that a lot of professionals already perform this type of testing in the field without the qualification, so RPL should be a route to be implemented;

During IIS workshop, participants have reported that a wider knowledge required should still be relevant to destructive testing and this applies to both ICT and language-related skills.

The following table includes some further relevant comments collected during the national workshops.

PARTNER	COMMENTS
Institutul National de Cercetare Dezvoltare in Sudura si Incercari de Materiale - ISIM Timisoara, Romania	Regarding the need of previous requirements for the attendance of a DT Qualification training course, the questionnaire considered 3 aspects: previous experience in the DT area, educational background and previous knowledge on specific subjects such as material science, ICT, and English.

	Regarding previous work experience entry requirements, there seems to be a full spectrum of opinions (see graph 5): -2 VET providers answered “No previous or very little experience” required, -5 VET providers stand for a minimum of one to three years of work experience and -1 VET providers find it insufficient to have less than 3 years of professional experience to enrol on a DT training course. As for minimum educational entry requirements perceived as necessary for enrolling a DT training course, these were mainly EQF level 4. 2 respondents did, however, see a lower than NQF level 4 educational background not as a limitation for enrolling in such courses (see graph 5). Regarding the previous knowledge, on specific subjects there is a consensus that it helps but it would be not mandatory or restrictive, but it would be an excellent start for this qualification.
European Federation for Welding, Joining and Cutting, Belgium	All participants agreed that candidates/applicants must have basic knowledge on material science and engineering to attend the European Destructive Testing Technician qualification (100%) and basics on English language (67%). Less participants agreed they must also have basic level of skills in ICT (22%), and the same percentage mentioned “any kind of welding education”, and “knowledge in NDT - ISO 9712 levels” The majority of results obtained in the survey are for entry EQF level 5, because the trainers want the trainees to have as higher education as possible when they enter their courses. However, EQF levels should be as low as possible. For this qualification to be as efficient as possible and bring additional diplomas, it needs to be as flexible as possible. So, if you are aiming for EQF level 4, the entry requirement should be even lower; -The trainee should have at least basic knowledge in welding before entering this qualification; – Between 1- 3 years working experience in working with testing; - Vision inspection/visual evaluation (according to ISO 9712)
Instituto de Soldadura e Qualidade, Portugal	In terms of previous requirements for the attendance of a DT Qualification training course, the questionnaire considered 3 aspects: previous experience in the DT area, educational background and previous knowledge on specific subjects such as material science, ICT, and English. Regarding previous work experience entry requirements, there seems to be a full spectrum of opinions, as all options were fairly balanced: - 3 VET providers answered “No previous or very little experience” required, - 2 VET providers stand for a minimum of one to three years of work experience and - 3 VET providers find it insufficient to have less than 3 years of professional experience to enrol on a DT training course. As for minimum educational entry requirements perceived as necessary for enrolling a DT training course, these were mainly EQF level 4. 2 respondents did, however, see a lower than NQF level 4 educational background not as a limitation for enrolling in such courses. Regarding those specific subjects whose previous knowledge is seen as necessary as an entry requirement, the subject whose

	knowledge was considered the most needed was materials science and engineering at a basic level, which was referred to by 5 in 8 (63%) respondent VETs. Equally important seem to be a basic knowledge of Information and Communications Technology as well as an advance knowledge in English. These answers are consistent with the knowledge that is acquired in EQF level 4 in Portugal.
Istituto Italiano della Saldatura – Ente Morale, Italy	The minimum requirements to apply and successfully complete the EDTT are dependent on the area that one specific technician is supported to cover. Some testing requires repetitive procedures and, if engineers are there to support on the results interpretation and supervision of the procedure, the job activity can be delivered without any need to target higher proved EQF or higher proved language skills and ICT knowledge.
Łukasiewicz Research Network - Institute of Welding, Poland	The survey addressed the minimum requirements according to the respondents for enrolment and smooth participation in the course in terms of education, work experience and skills. In terms of minimum educational requirements, 50% of respondents indicated EQF level 4 as the minimum, 25% indicated EQF level 5 and 25% EQF level 6 (Figure 3). Regarding previous work experience the answers were evenly distributed between two options (Figure 4): • No previous work experience or less than 1 year - 50%, • 1-3 years of previous work experience - 50%.

Table 5.2.1 – Comments taken from the national workshops conducted from each partner about the entry requirements.

5.3. Training Implementation

Figure 9 provides an indication of what VET centres suggest in terms of dividing training between practical and theoretical lessons. Almost all partners, with the exception of EWF, have seen a tendency for VET centres to suggest that 60% of the training time is devoted to the practical part. The 50% split options and the 60% theoretical training option also performed well. The option of having 70% practical or theoretical training has received little approval overall, demonstrating that a balance between theoretical and practical training is considered necessary.

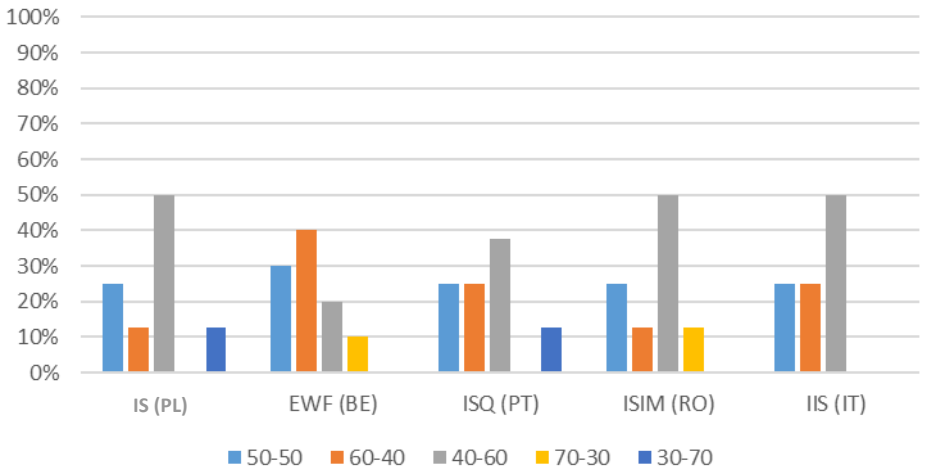

Fig. 9. Advised split theoretical (former) / practical training (latter) (Questions for VET providers - question #8).

During IIS workshop it was suggested that the split is shaped according to initial trends and results gathered in running the training.

Figure 10 indicates which subjects are suggested to be included in the theoretical part of the course. The main subject considered necessary to be taught, according to all respondent VET centres, is the characterization of the mechanical and material properties. High importance is also occupied by the use of the equipment. Slightly less highlighted was the quality control. Finally, there was interest, albeit reduced, in the preparation of the specimens and knowledge of standards and regulations.

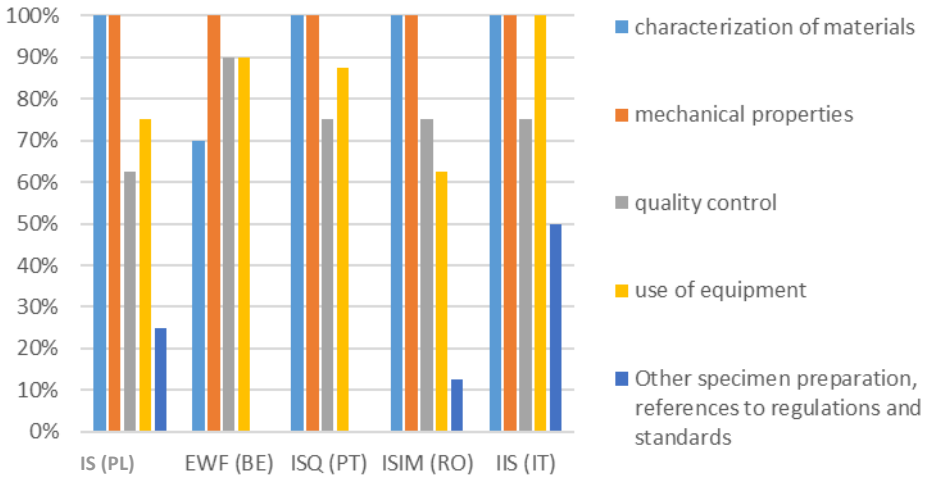

Fig. 10. Advised topics in theoretical modules (Questions for VET providers - question #9).

Figure 11 shows the advised materials to be investigated in the training. Steels, aluminium and copper are the most voted materials among the metals to be addressed by the European Destructive Testing Technician qualification, according to survey participants. Other materials were also mentioned, but with lower results.

Figure 12 shows the equipment that VET centres consider necessary to have in order to deliver the course. The equipment considered essential everywhere are the pulling machine, the hardness measuring machine and the impact resistance machine. IIS, ISQ and IIS have also identified a strong interest in fatigue measurement equipment. Some VET centres have also indicated the importance of additional equipment, including those for tribological measurements. In none of the centres interviewed it was considered adequate to implement the course without having any equipment.

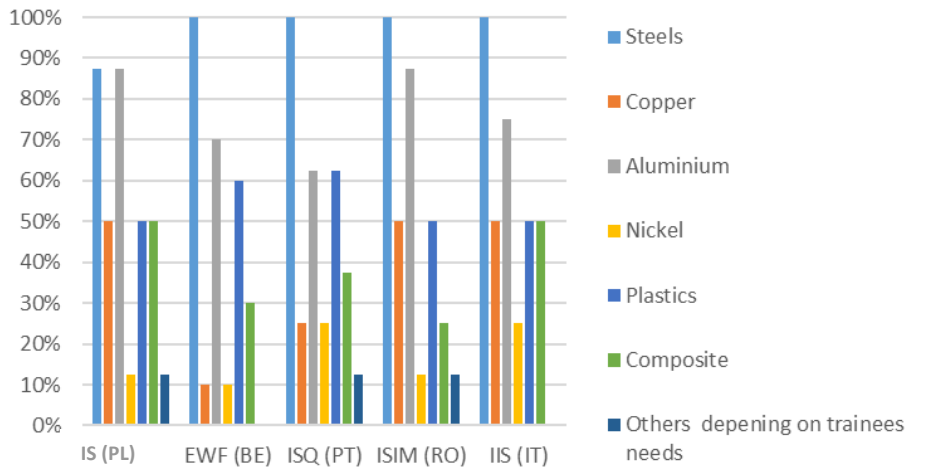

Fig. 11. Advised materials to be assessed (Questions for VET providers - question #10).

During IIS workshop, some participants have indicated that some sets of tests have common points across different materials, so the qualification path should take this into account to realize an effective and efficient use of resources.

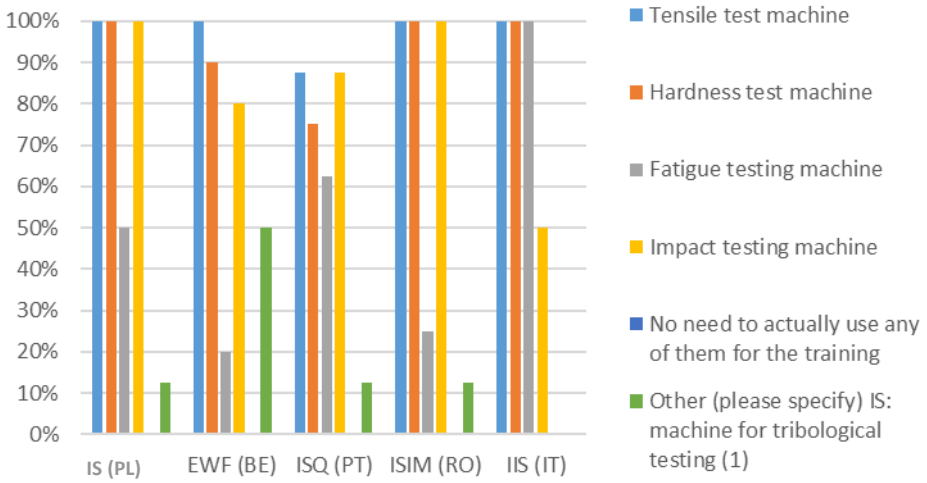

Fig. 12. Advised need for overall equipment (Questions for VET providers - question #6).

Figure 13 shows the equipment that VET centres recommend for training on metallographic tests. For all the centres interviewed by the partners, the greatest importance is given to the optical microscope, followed by the SEM and EDS. The results in the various countries were rather homogeneous.

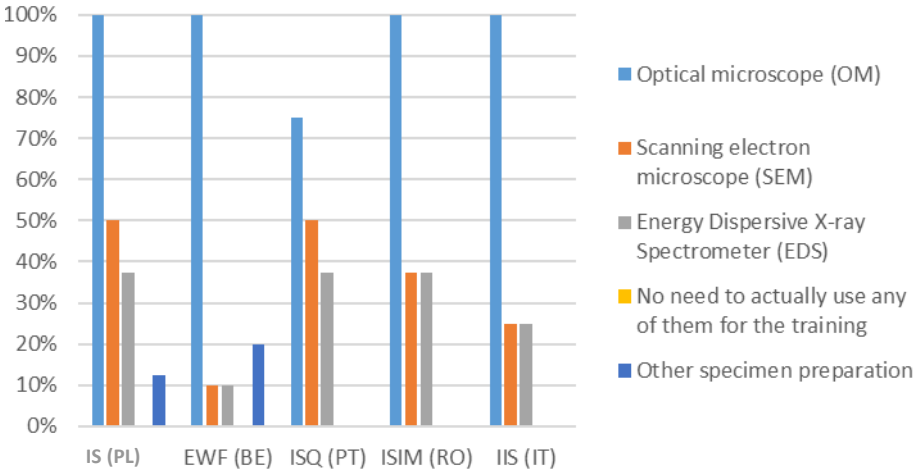

Fig. 13. Advised need for metallography equipment (Questions for VET providers - question #7).

Figure 14 shows the suggested approach for instructor training. Most VET centres indicated a suggested approach involving practical courses, accompanied by the analysis of case studies. Furthermore, all partners learned from the VET centres the importance of transferring innovative practices. Simulation was considered non-fundamental, uniformly across all nations.

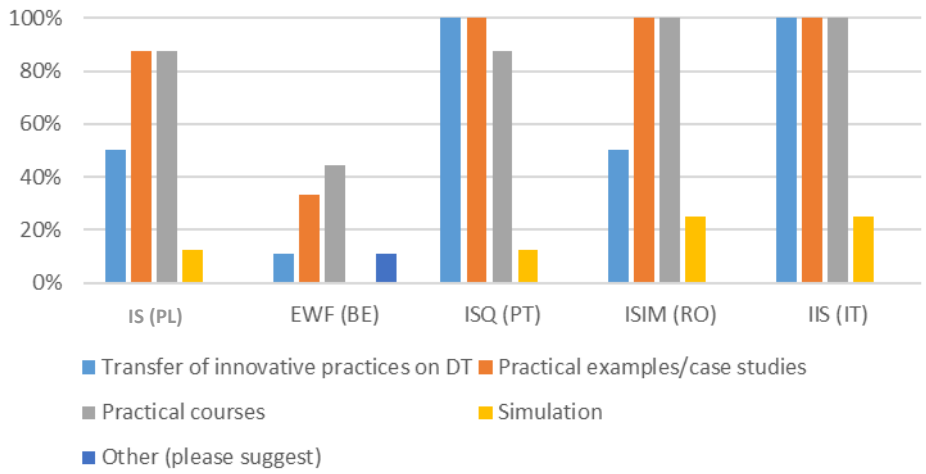

Fig. 14. Advised methodology to train the trainers (Specific questions about the VET Providers' Trainers - question #13).

5.4. Current VETs capacity and capabilities

Figure 15 shows the current capacities and capabilities held by VET centres. According to what was reported by all partners, except ISQ, the equipment owned by the VET centres generally consists of the hardness machine and the traction machine. Only half of the IIS respondents have a machine for measuring impact resistance. A greater number of VET centres owning the latter machine were registered in the centres interviewed by ISIM, IS and EWF. ISQ reported that the most available equipment is the traction machine and the optical microscope, but no equipment need exceeds 50%. A significant percentage of centres interviewed by all partners confirmed that they have an optical microscope.

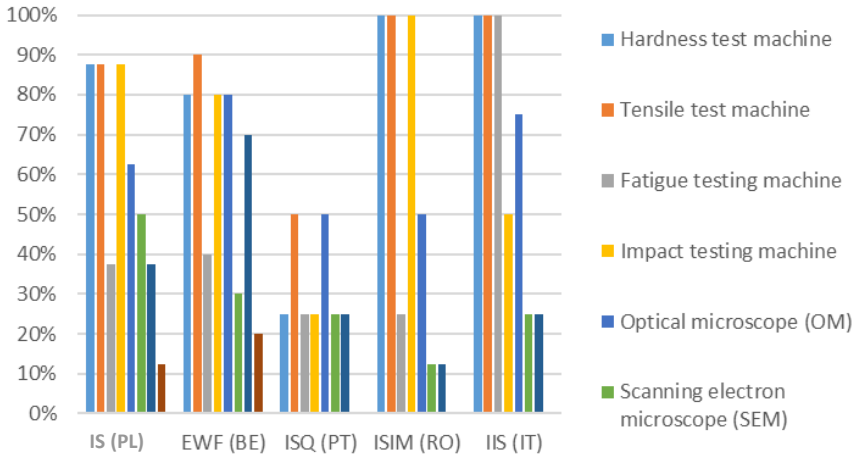

Fig. 15. Equipment currently available at VETs facilities (Questions for VET providers - question #5).

During EWF workshop, it was advised to have a smaller range in terms of equipment required in VET schools for this qualification, because the wider it is the less schools will implement it.

Figure 16 shows the current technical knowledge that instructors possess to be able to teach within the course. IIS reported that all respondents believe they already have all the necessary skills available. On the contrary, ISQ pointed out that most of the centres believe that there

are topics on which further training of the instructors is needed. The data reported by IS, EWF and ISIM are similar and fairly evenly distributed. VET centres have rarely indicated that they have no knowledge of this.

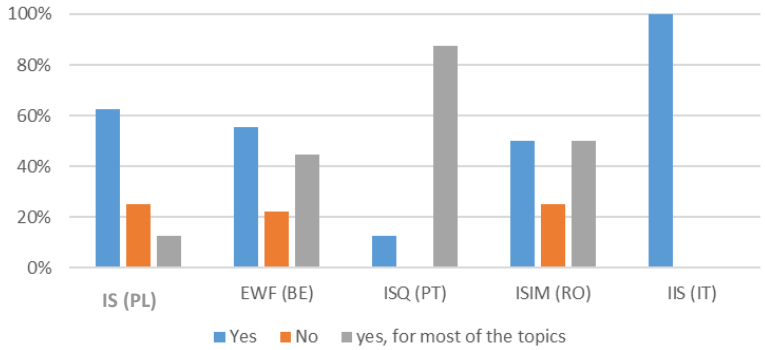

Fig. 16. Current knowledge of trainers across required topics (Specific questions about the VET Providers' Trainers - question #12).

Figure 17 shows the current knowledge of trainers in relation to recent technological developments. VET centres agree that the training of instructors tends to be up to date. A slight uncertainty was found only in the data provided by ISQ, given that a not negligible part of the centres indicated that they do not have state-of-the-art knowledge.

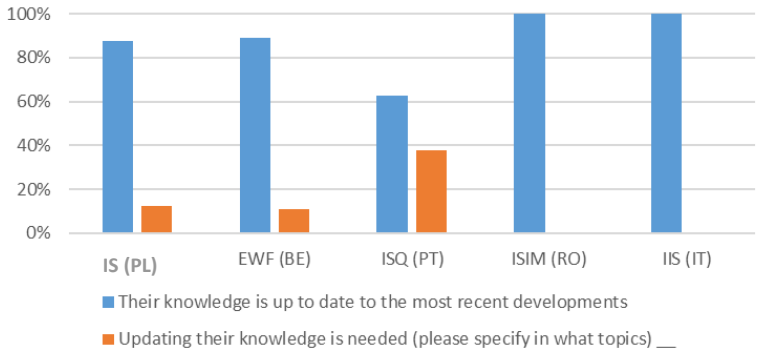

Fig. 17. Current knowledge of trainers against recent technological developments (Specific questions about the VET Providers' Trainers - question #12 "if yes").

PARTNER	COMMENTS
Institutul National de Cercetare Dezvoltare in Sudura si Incercari de Materiale - ISIM Timisoara, Romania	Capacity and capability refer to the in-house training settings that refer to the allocated equipment, consumables and the needed human resources. Regarding the trainers´ knowledge and suitability for a DT Technician, 10% of the respondent VET centres claim their trainers have the right level of qualification and the right skills and competences for the job, while 90% claim that the trainers are duly qualified for most of the course topics. However, when asked specifically how likely their knowledge on destructive testing is to be fully updated with the latest technological developments in this area, almost 50% admit they would need to refresh their knowledge on the subject.
European Federation for Welding, Joining and Cutting, Belgium	Have a smaller range in terms of equipment required in VET schools for this qualification, because the wider it is the less schools will implement it.

Instituto de Soldadura e Qualidade, Portugal	Capacity and capability refer to the in-house training settings in the VET centres pertaining to both equipment and human resources available. Regarding the trainers´ knowledge and suitability for working on a destructive testing training qualification, 12,5% of the respondent VET centres claim their trainers have the right level of qualification and the right skills and competences for the job (see graph 13), while 87,5% claim that the trainers are duly qualified for most of the topics. However, when asked specifically how likely their knowledge on destructive testing is to be aligned with the latest technological developments in this area, almost 40% admit they would need to refresh their knowledge on the subject
Istituto Italiano della Saldatura – Ente Morale, Italy	**Trainers claimed that the suitable level of knowledge associated to newly developed set ups and procedures is generally already in place. If some competences are not in house, they would still be able to appoint a trainer who would cover the job ad a ordinary procedure they are already used to undertake**
Łukasiewicz Research Network - Institute of Welding, Poland	Have a smaller range in terms of equipment required in VET schools for this qualification, because the wider it is the less schools will implement it. In terms of implementation of the DT course, the first aspect addressed in questionnaire was required equipment to conduct the DT training. All asked VET providers mentioned tensile test machine, hardness tester and impact test machine as necessary equipment for the practical training in destructive testing. Next aspect addressed was required equipment for practical training in metallography. Here, everyone mentioned optical microscope, 50% mentioned scanning electron microscope (SEM) and 37,5% mentioned energy X-ray spectrometer (EDS). One VET provider mentioned equipment for section preparation (cutting, grinding and polishing machines). In terms of combination between theoretical and practical parts of the training, the results indicate there is tendency towards higher share of practical share. Next most chosen answer was splitting theoretical and practical part by 50-50. Only 1 VET provider voted for higher share of theoretical training. As for contents of theoretical training, as shown in Figure 9 all of the respondents voted for “characterization of materials” and “mechanical properties”, 63% voted for “quality control” and 75% voted for “use of equipment”. There were also other answers like “references for laws and standards” (13%) and “preparation of specimen” (13%)

Table 5.4.1 – Comments taken from the national workshops conducted from each partner about current VETs capacity and capabilities

6. Assessment of Industry and employer insights for the definition of Destructive Testing (DT) technician qualification path

The results shown in this paragraph are referred to the data (percentages and absolute numbers of responses per country) reported in the TRUST IO overall feedback table of results in appendix 8.

6.1. Background information on the companies assessed and current demand for testing

Figure 18 provides an indication of the size of the companies interviewed to give their contribution on the needs and expectations in defining the qualification path for operators who perform destructive checks. All partners identified a rather homogeneous population of respondents, including small, medium and large companies. The least represented population was that of small businesses, with the exception of the data collected by EWF.

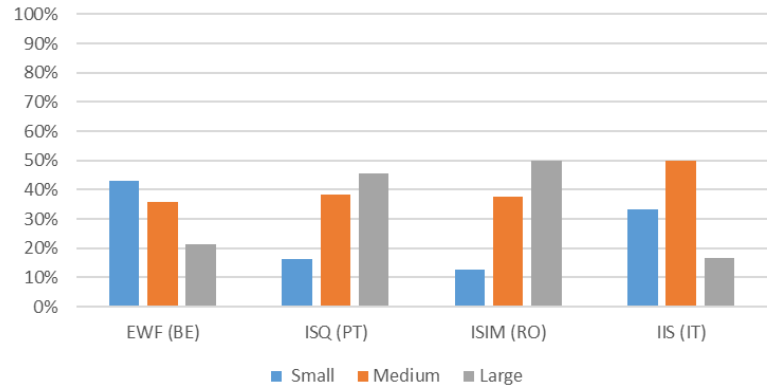

Fig. 18. Size of companies interviewed (Questions for technicians and employers - question #1)

Figure 19 shows the sectors in which the interviewed companies operate. The sectors most represented include construction, energy, industrial equipment and tooling. Next, the automotive and transport sectors are noted. Aerospace and defence are the least represented sectors.

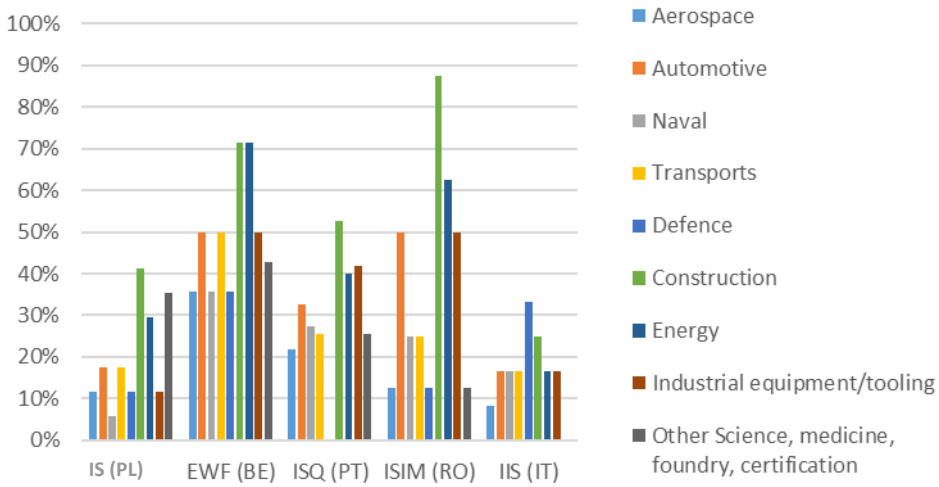

Fig. 19. Sectors in which companies interviewed are mainly active (Questions for technicians and employers - question #2)

Figure 20 shows the industries with the highest demand for destructive testing. The leading sectors are construction, energy, industrial equipment and tooling. Next, the automotive and transport sectors are noted. Aerospace and defence are the least represented sectors. These results are in line with the sectors to which the companies surveyed belong.

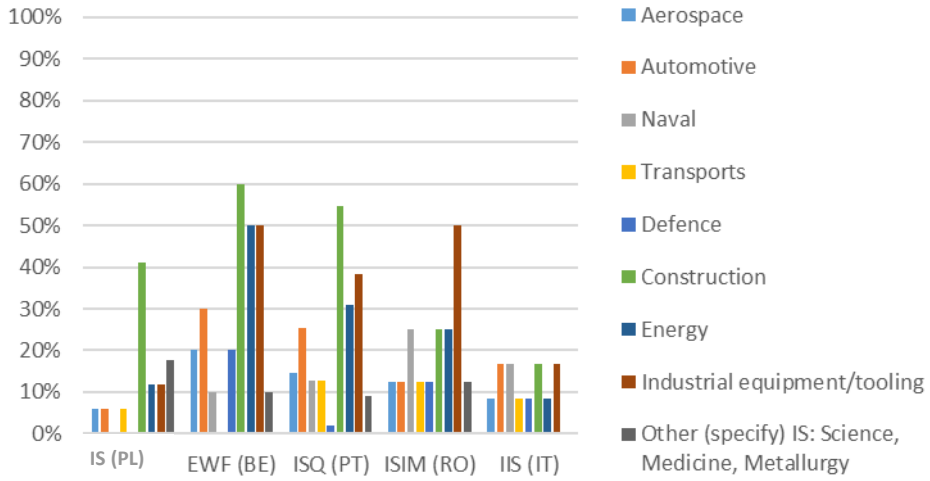

Fig. 20. Sectors with higher demand for DT (Questions for technicians and employers - question #8)

Figure 21 shows which tests are most performed by companies. The most frequent tests include tensile tests, hardness tests and impact tests. The fracture test, bend test and shear test follow. The fatigue tests are in great demand by the companies interviewed by IIS and, to a lesser extent, by ISQ and EWF. A poor result for fatigue tests was recorded by IS and ISIM.

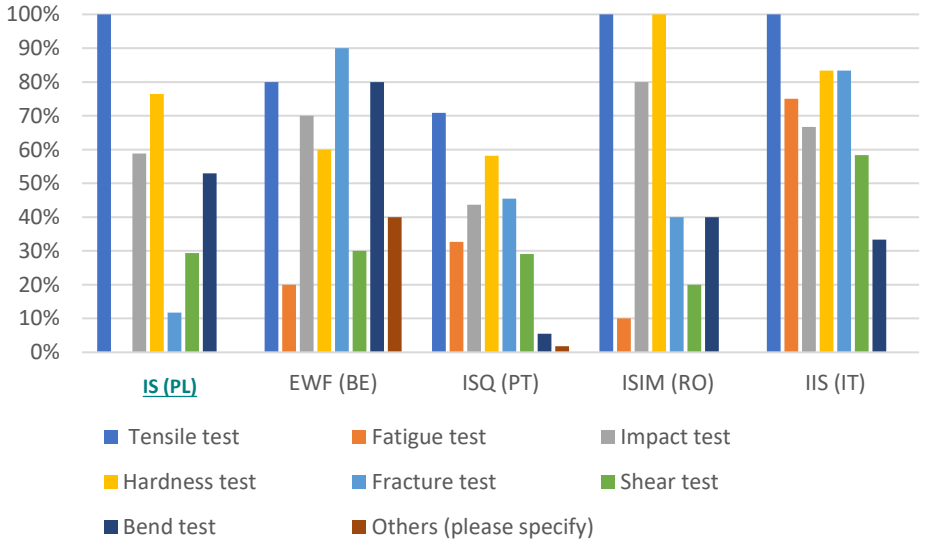

Fig. 21. Most commonly performed tests (Questions for technicians and employers - question #23)

Figure 22 shows the division used by the companies interviewed between operators who perform destructive tests and those who perform metallographic tests. The results recorded by the various partners are very similar and indicate a balanced distribution between companies that operate a subdivision and companies that do not. A slight disparity was recorded by ISIM and IIS. ISIM indicated that most companies are adopting the same operator, while IIS indicated an opposite trend.

ISQ collected feedback from participants regarding the tests technicians normally perform. The results are as follows:

- DT: Tensile tests, Fatigue tests, Impact tests, Hardness tests, Fracture tests, Shear tests and Bend tests
- Other activities:
  - Technical assistance
  - Preventive and corrective industrial maintenance
  - Repair of submersible pumps
  - Maintenance of artesian holes (cleaning and installation of equipment)
  - Flow tests,
  - Rehabilitation of metallic reservoirs,
  - Macrography,
  - Boiler operations,
  - Analysis and approval of the Inspection and Testing Plan and its follow-up,
  - Inspections of suppliers' services and products,
  - Verification of welds and cracks and Quality control

6.2. Current resources and competences in industry

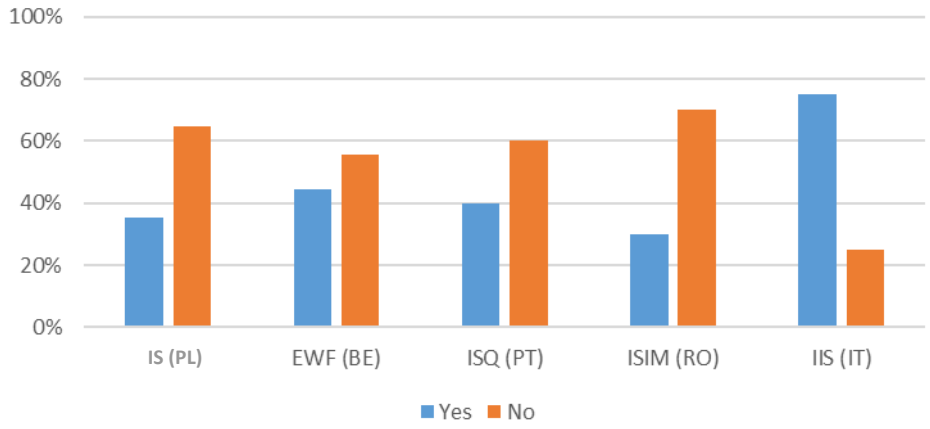

Fig. 22. Presence of different operators for mechanical testing and metallography of welded joints (Questions for technicians and employers - question #14)

Figure 23 indicates the average level of education of the technicians who work in the company in destructive testing. All partners, with the exception of IIS, indicated a uniform distribution, with companies allocating workers with different levels of education. On the other hand, IIS indicated that the most widespread level of education among DT technicians is EQF level 4. As for the other partners, some of the companies interviewed indicated the presence of personnel with a level of education even higher than EQF 5. According to the data of IS, it is noted that the level of education of the technicians who work in DT in Italy is the highest of all.

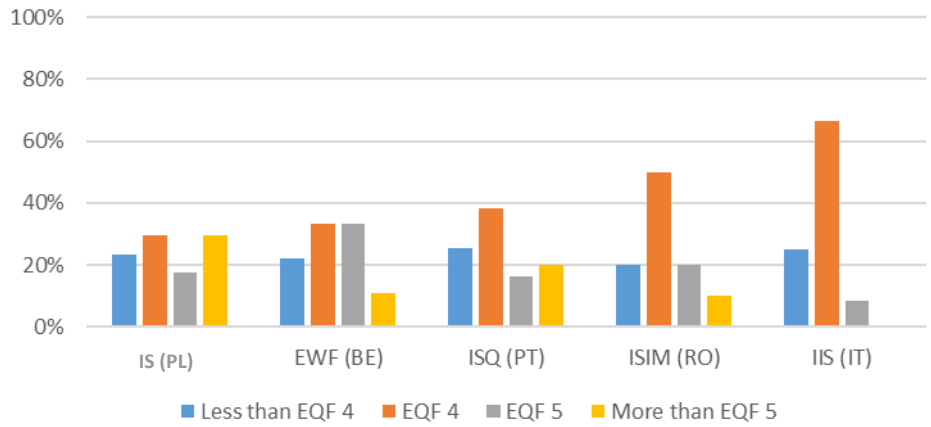

Fig. 23. Average education level of DT technicians currently employed (Questions for technicians and employers - question #18)

Figure 24 shows the average number of years of experience of the technicians employed in the DT. The data collected by the partners is very similar. The average number of years of experience in 20% of cases falls below 2 years. Most technicians have more than 5 years of experience. A smaller percentage has an average age between 2 and 5 years. According to data from IIS and EWF, no technicians with less than 2 years of experience were found.

Fig. 24. Current years of experience DT technicians currently employed (Questions for technicians and employers - question #19)

Figure 25 indicates the knowledge held by the DT technicians from the respondent companies on DT related technical standards. All partners refer to an advanced level of knowledge in DT-related-standards for the DT technicians working in the majority of the respondent companies. EWF, ISQ and ISIM found a similar distribution between subjects with advanced experience and subjects with basic experience. Very rarely, the respondent companies indicated the lack of knowledge of the technical standards on the part of the operators.

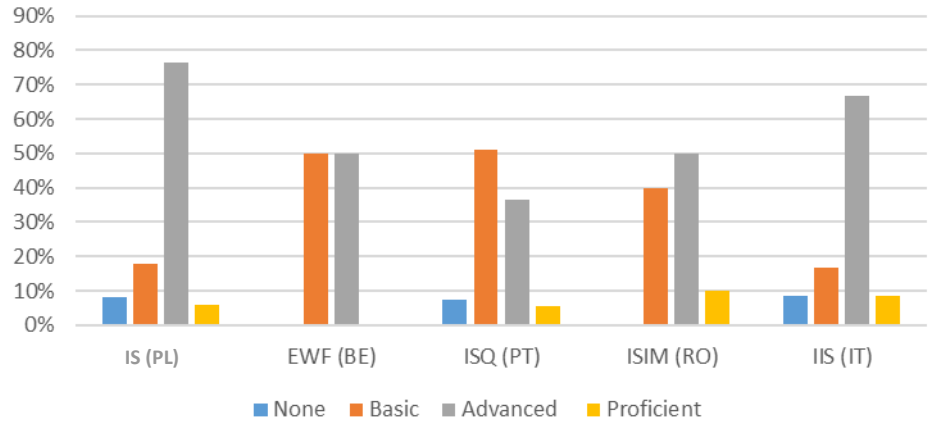

Fig. 25. Current knowledge of technical standards of DT technicians currently employed (Questions for technicians and employers - question #20)

Figure 26 shows the knowledge possessed by technicians in the field of robotic systems. In this case, the respondents from ISQ indicated the lack of knowledge of the subject. A small part of the respondents from the other partners presented the same result. For most of the respondents from IS, ISIM and EWF, the knowledge of robotic systems is basic. The companies surveyed by IIS are divided fairly evenly, with a majority of companies indicating that their technicians possess advanced knowledge.

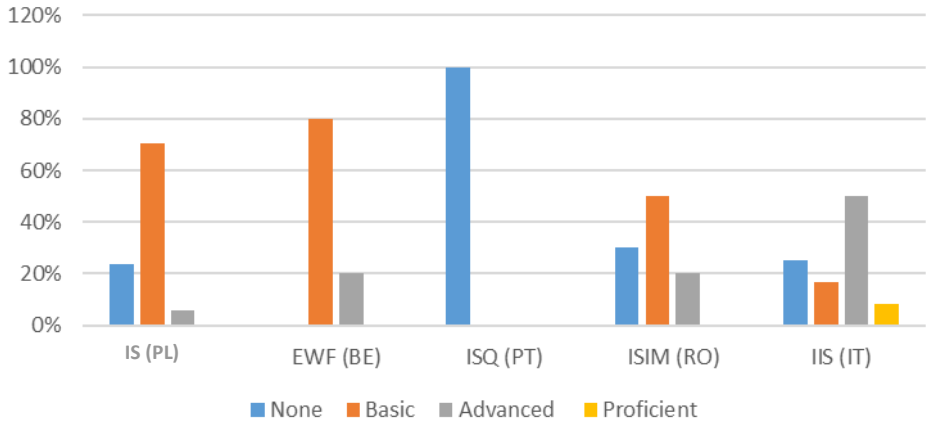

Fig. 26. Current knowledge of robotic systems of DT technicians currently employed (Questions for technicians and employers - question #21)

6.3. Current competences and responsibilities of DT technicians

Figure 27 shows the level of decision-making responsibility of the operators involved in destructive testing. In the case of IS, IIS and ISIM, the companies interviewed are divided fairly equally between those who entrust decision-making skills to the operator and those who delegate this activity to the engineer. In the case of the companies interviewed by EWF, the trend is towards decision making entrusted to the technician. On the contrary, in the case of ISQ, the trend is towards the decision making entrusted to the engineer.

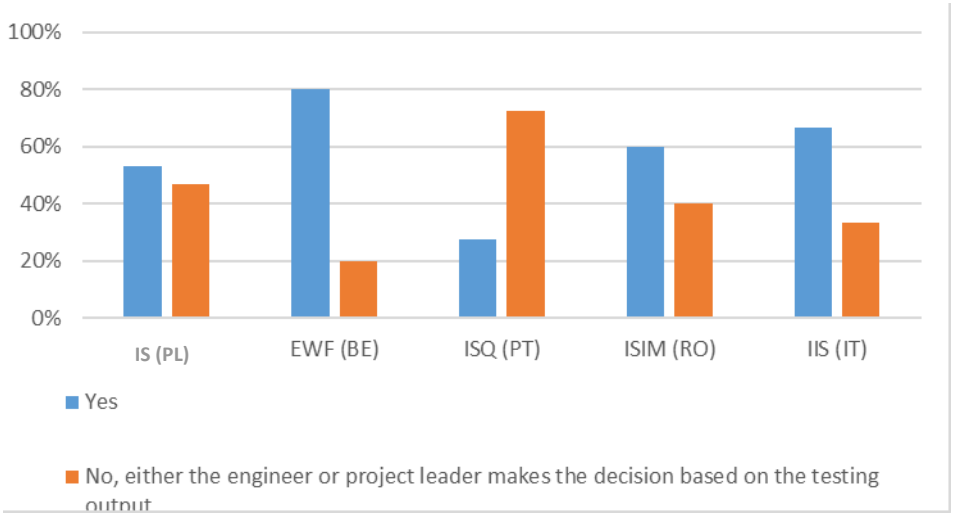

Fig. 27. Level of autonomy if DT technicians currently employed (Questions for technicians and employers - question #10)

Figure 28 shows the percentage of technicians who have responsibility for compiling technical reports. For all partners, it has been recorded that technician, in most cases, are involved in compiling the technical reports. The data reported by EWF and ISQ have a greater impact of this trend, while the data are more uniform in the case of IS, ISIM and IIS.

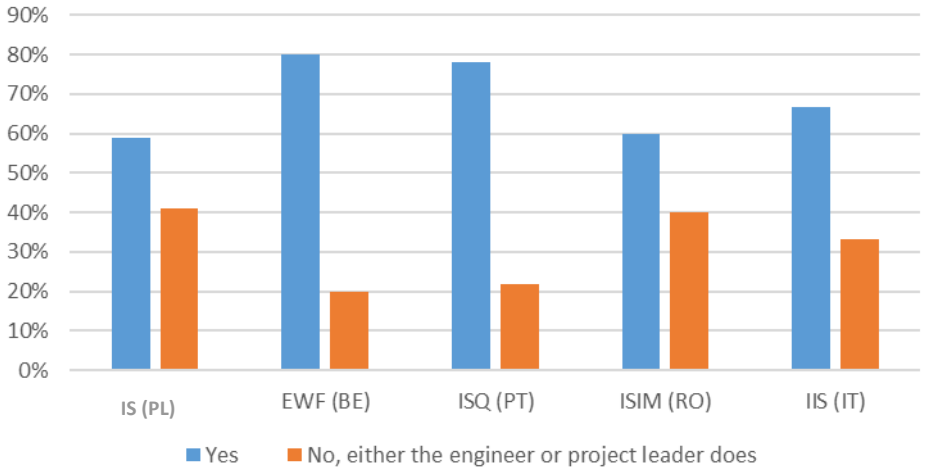

Fig. 28. Responsibility in report filling of DT technicians currently employed (Questions for technicians and employers - question #11)

Figure 29 shows the degree of involvement of technicians in the compilation of the DT technical reports. The data reported by EWF, ISQ and ISIM indicate that the most widespread level of involvement extends up to the conformity assessment. IS and IIS reported that in most cases technicians contribute to the compilation of reports by adding comments. A small percentage indicated additional contributions extending into test parameters, equipment to use and assessment of test results.

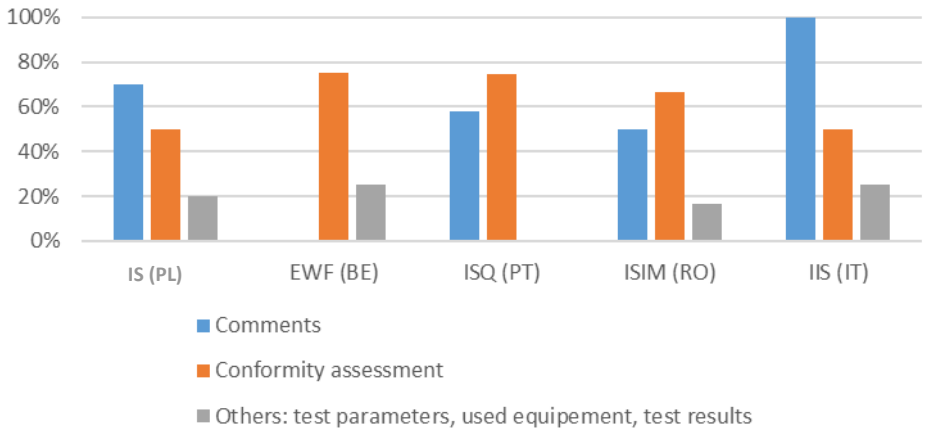

Fig. 29. Degree of inputs providing in reporting of DT technicians currently employed (Questions for technicians and employers - question #11 "If yes, to what extent?")

During the workshop, ISQ collected feedback from participants regarding other inputs provided by technicians. The results are as follows:

- Characterization of the sample material to be tested
- Need for repairs
- Equipment used
- Data on the test procedure (parameters, methodology applied,

6.4. Current training approach adopted by employers

In Figure 30, the preferences of the companies regarding the previous level of professional experience of the personnel hired for the execution of the destructive tests are indicated. In the case of EWF and ISQ, the selections are evenly distributed, so all the different approaches are taken into consideration. IIS indicated that most companies would prefer to hire a junior figure to be trained through the DT qualification, while ISIM and IS found a majority of companies that would prefer to hire experienced senior figures. All partners reported that about 30% of the companies interviewed are in favour of hiring junior staff to be trained with on-the-job training. Furthermore, 30% of the companies indicated that they have no preferences.

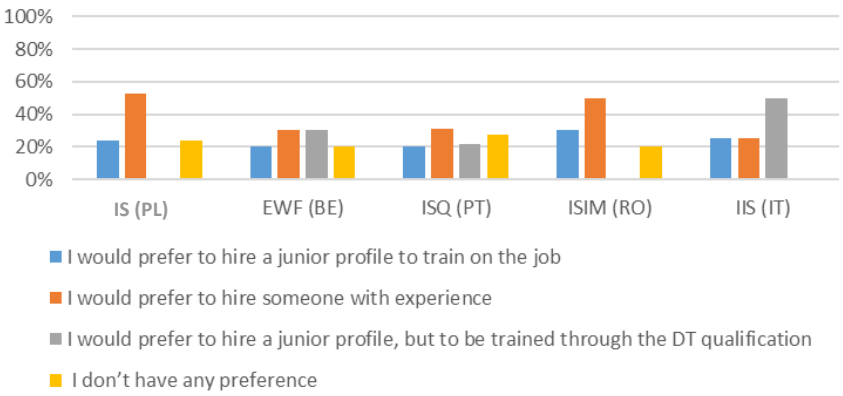

Fig. 30. Requested seniority when hiring a new employee (Questions for technicians and employers - question #15)

Figure 31 shows the training path for new hires in charge of destructive tests. According to data provided by ISQ, ISIM and IIS, most companies organize in-house training conducted by external trainers. IS, on the other hand, referred to a majority of companies that support self-learning. IS; ISIM and IIS reported a very significant trend towards webinar participation and internal training. Companies interviewed by ISQ are much less inclined to train through webinars.

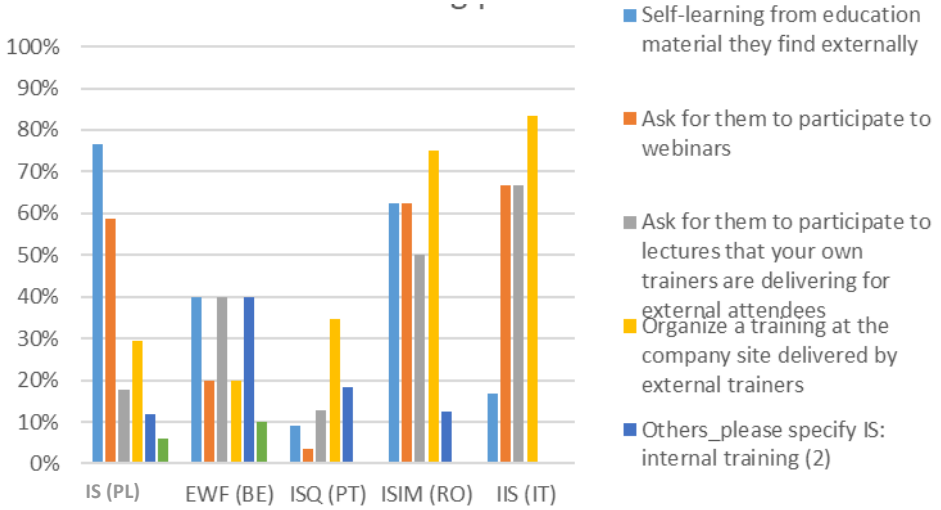

Fig. 31. Current training path for new hires (Questions for technicians and employers - question #9)

Figure 32 shows the time that new hires spend on completing the training. All partners indicated that most companies prefer a training period ranging from 6 months to a year. Very rarely, companies expect training that lasts more than one year, with the exception of companies interviewed by EWF.

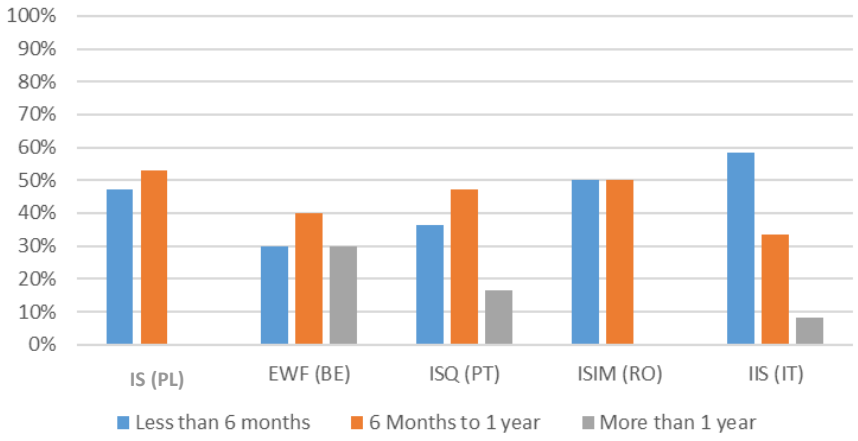

Fig. 32. Current training period of new hires (Questions for technicians and employers - question #12)

Figure 33 indicates the degree of resourcefulness of technicians in self-learning. In the case of IS, ISIM and IIS, there is a rather homogeneous division between companies that believe in self-learning and companies that are not very confident in self-learning and prefer mandatory training to update skills.

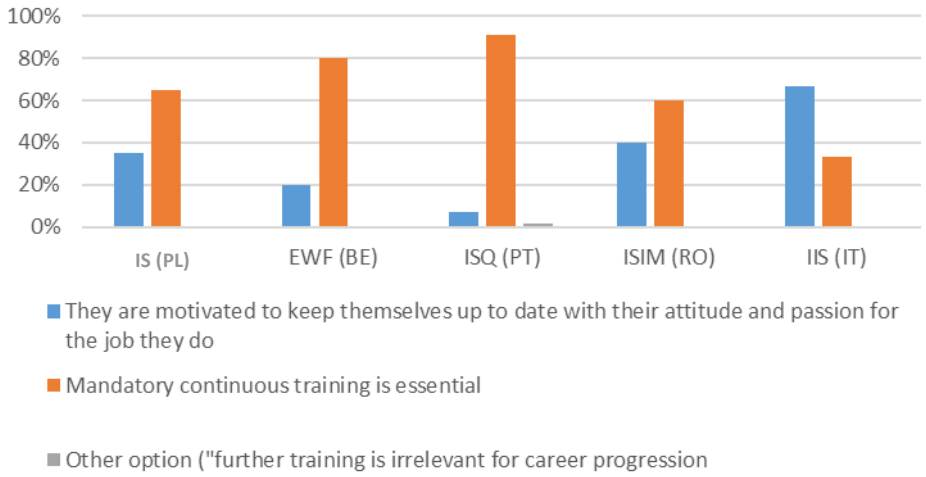

Fig. 33. Attitude of technicians in self-learning (Questions for technicians and employers - question #22)

During the IS national workshop, some participants suggested that there should be some kind of short lectures for technicians held maybe once per year or two, summarising all the recent changes in standards.

6.5. Need for destructive testing qualification, added value perceived and expectations

Figure 34 shows the occurrence of situations in which companies are required to demonstrate the skills of their technicians to perform destructive tests. In the case of IIS, almost all companies surveyed indicated that they receive such requests. The companies interviewed by the other partners, on the other hand, are divided equally between those who receive this type of request and those who do not.

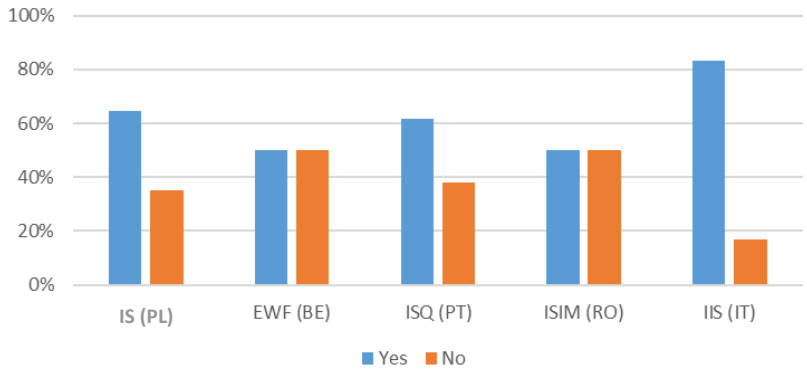

Fig. 34. Eventuality of requests to demonstrate DT skills of technicians (Questions for technicians and employers - question #5)

Figure 35 shows the frequency with which companies that have received requests for proof of competences receive this type of request. The most widespread trend indicates that this request comes about once every year or once every 1-2 years.

During IS workshop, participants acknowledged that not only is there a lack of destructive testing technicians with experience and skills on the market, but also a lack of young people who are willing to undertake training in this profession. To cite the IO1 National report of IS: “Summarizing the results from questionnaire and Co-creation Workshop the companies, both VET providers and testing laboratories are looking forward to a new EDTT qualification that

would help them ensuring that staff performing DT is on highest level possible. Companies are also looking forward increasing awareness of existence of DT technician profession amongst younger people as well increasing their technical knowledge, so they are more suited to the job.

In terms of progress of training course, it was suggested during workshop that the qualification should be divided into different levels, where basic levels should be more focused on practical part. Considering the amount of changes in technical standards, workshop participants pointed out that qualification should be time limited with required recertification every fixed period of time or renewed in some different ways (perhaps by attending lectures about changes in standards?).”

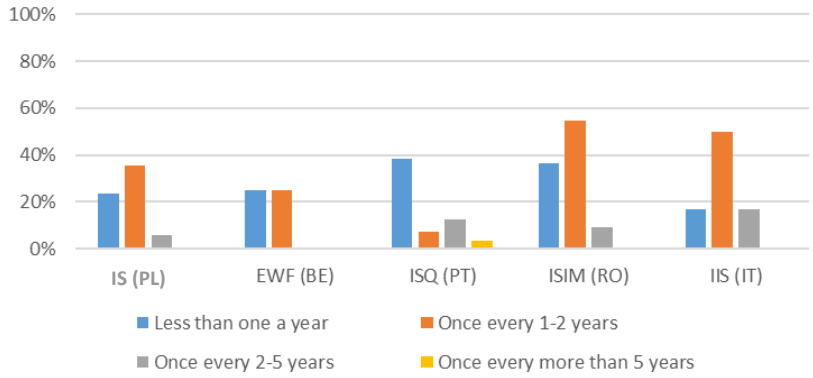

Fig. 35. Frequency of requests to demonstrate DT skills of technicians (Questions for technicians and employers - question #5 “if yes, how often?”)

In the ISQ workshop this aspect was explored a bit further. Participants were asked about what clients were looking for when asking for evidence of the companies having the right skills and knowledge to perform destructive testing. Most participants referred to this pertaining to certification procedures being applied by the DT operations as well as to the people performing the tests having the right qualifications and, especially, whether or not there was a qualified engineer supervising the testing procedure, for quality assurance purposes.

As for the destructive tests technicians´ level of knowledge on DT-related technical standards, only 7% of the companies refer to their DT personnel having no knowledge about related technical standards. Moreover:

- the majority of companies (51%) refers to a basic level of knowledge
- 36% of the companies refer to an advanced level of knowledge and
- 5% refer to a proficient level of knowledge of DT related technical standards.

So, even though half the respondent companies refer to a basic level of knowledge regarding DT related technical standards, for a significant proportion of the respondent companies DT technicians’ average level of knowledge on these standards is quite high.

Finally, all companies referred to their DT technicians having no knowledge on robotic systems.

Figure 36 shows what companies believe to be the added value of the DT qualification. The reasons that contribute to building added value are various and, in general, uniformly recognized by companies.

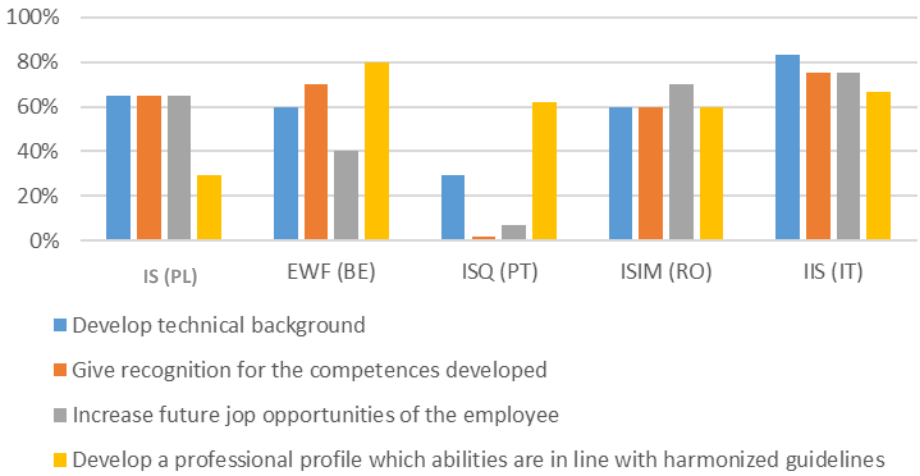

Fig. 36. Added value perceived for DT qualification (Questions for technicians and employers - question #24)

Regarding the expectations related with the training course and the qualification, this was explored in more depth in the workshop run by ISQ.

Having in mind the specificity of each testing procedure in terms of the material being tested and the specific standard applicable, several participants in the workshop mentioned the importance of a deeper technical knowledge on these matters for the quality and adequacy of the work performed.

They feel there is a lack of good technicians in the market, in-between the executer and the person in charge, who is generally the engineer. Many companies thus feel the need for having a more qualified person.

The participants in the workshop showed some expectations in terms of having these aspects covered by the new qualification.

During the IS workshop it was suggested that the qualification should be divided into different levels, where basic levels should be more focused on practical part. Considering the amount of changes in technical standards, workshop participants pointed out that qualification should be time limited with required recertification every fixed period of time or renewed in some different ways (perhaps by attending lectures about changes in standards).

During ISIM workshop participants have emphasized the importance of focused technical knowledge to target high quality level of the test run.

Figure 37 shows the added value that companies identify in taking the DT qualification for new hires. With the exception of IIS, all the partners have found a unanimous opinion of the companies in considering an objective added value for the new hires. In the case of IIS, companies are divided equally between those who recognize its added value and those who are hesitant about it.

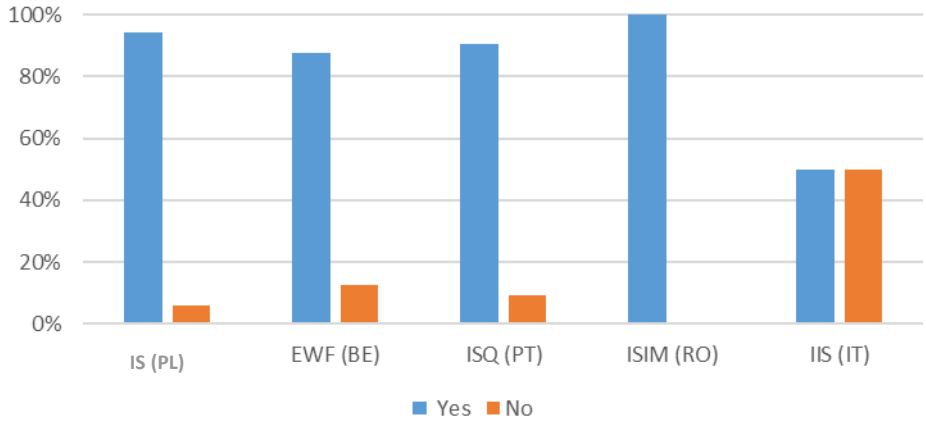

Fig. 37. Perception of added value of DT qualification for new hires (Questions for technicians and employers - question #16).

Figure 38 indicates the impact that companies recognize to ICT skills for an effective performance of the role of operator for destructive tests. Most of the companies surveyed by EWF and ISQ have given great importance to ICT knowledge, indicating that advanced knowledge is required. In the case of IS and ISIM, companies are divided between those who suggest basic knowledge and those who suggest advanced knowledge. The trend of the companies interviewed by IIS is towards a request for basic knowledge.

During the workshop, ISQ has collected feedback from participant regarding the added value of DT qualification for new hires. The results are as follows:

- Accrued value of the qualification in terms of the acquired capacity to give respond to new problems - higher autonomy in the work undertaken
- Support to the decision-making process
- More educated reasoning in terms of the execution of the task in those cases where decisions need to be made
- Contributes to reducing the duration of internal training and adaptation period of the new worker
- Would make it possible to perform DT in-house in those cases where we currently need to have them made by external service providers
- Would increase the employee chances to progress in his/her career

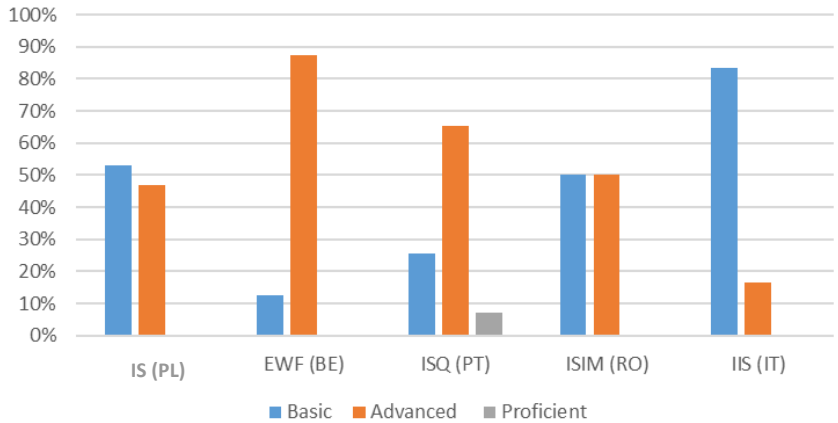

Fig. 38. Advised level of ICT skills for DT technicians (Questions for technicians and employers - question #17).

Figure 39 indicates the expectation of companies regarding the learning context, meaning the balance between time spent on the standard qualification path and the time to be spent on the job training. With the exception of EWF, the other partners have found a majority of companies that prefer to use 70% of the time for training on the job. This trend is very accentuated in the data reported by IS, ISIM and IIS. In the data reported by EWF, it is noted that the preference of companies is oriented towards a 50% split.

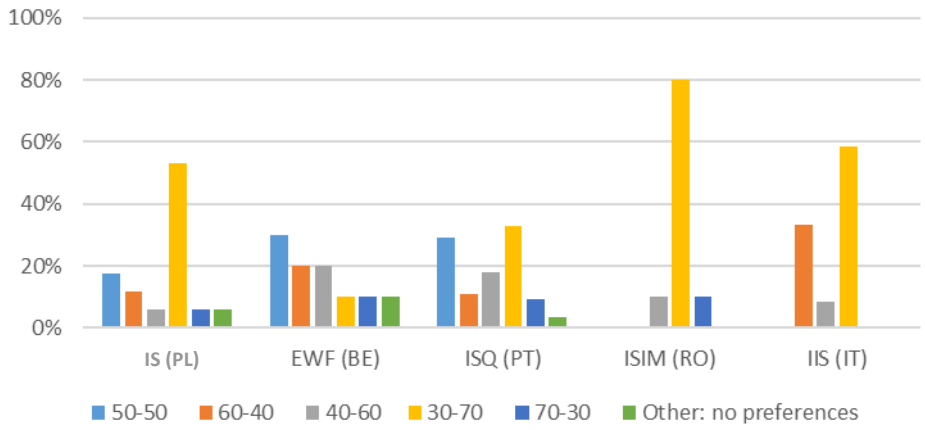

Fig. 39. The graph shows the results obtained from the answers about how to divide the time among DT qualification and training (Questions for technicians and employers - question #13)

In line with what was identified during EWF workshop, there is a bigger need for theoretical training in a qualification for Destructive Testing since the majority of professionals who perform this type of testing learn how to do it in the field with more experienced professionals (who also learn to do it in the field, by experience), but do not have sufficient theory to support their actions, so they need their work to be supervised by professionals with higher education levels;

In ISIM workshop it was mentioned that the level of qualification should be directly connected to the impact of theoretical part,

Figure 40 describes the importance given to the development of a versatile professional figure who deals, if necessary, with mechanical tests or metallographic analysis. All partners registered a shared interest of most companies.

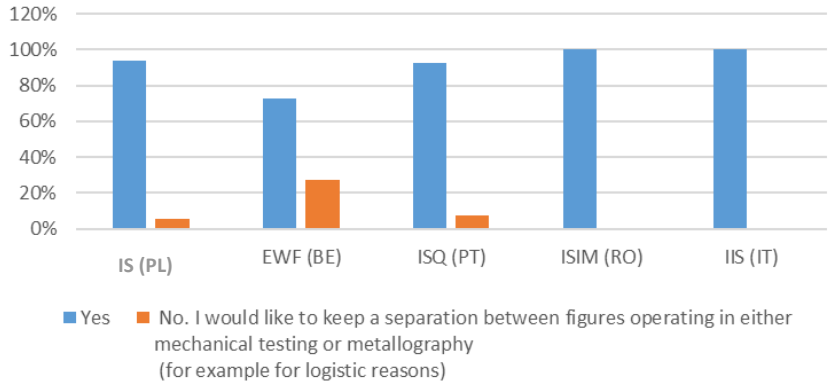

Fig. 40. Interest in having versatile professional profiles across departments (Questions for technicians and employers - question #3)

Figure 41 summarizes the importance that companies have attributed to the DT qualification to manage the handover between incoming and outgoing personnel. The companies have shown a shared interest.

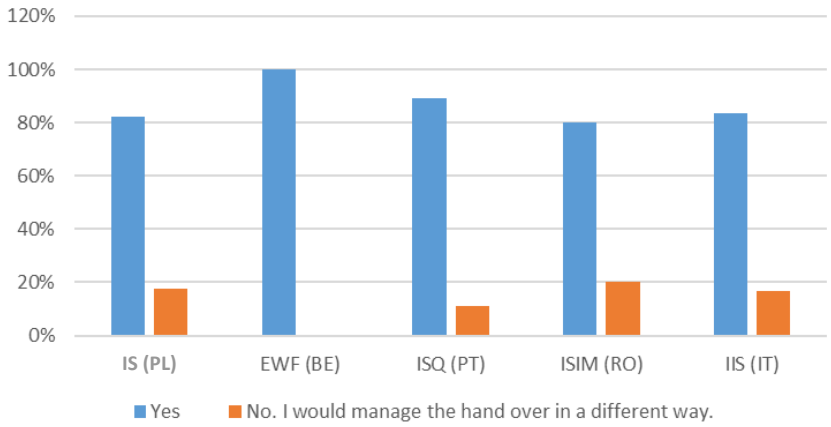

Fig. 41. Perceived utility of DT qualification for managing the handover (Questions for technicians and employers - question #7)

During the workshop, ISQ has collected feedback from participant regarding ways to manage the handover. The results are as follows:

- Hiring young people looking for their 1st job;
- Arranging sustainable solutions for the retirement of leaving workers;
- Training solutions in the form of internships;
- Replacing retiring workers with someone from the company
- Finding alternative ways by means of relocating workers given the fact that DT work is quite a small part of our work;
- Proving adequate training to existing employers in-house

7. Conclusion

From the study conducted there are several interesting points concerning both the evaluation of the current scenario and the way in which the development of the new professional figure can be implemented, ensuring that it is attractive to industry and training centers. The main points that emerged are summarized below:

- Many technicians learn how to carry out technical activities through the support of more experienced personnel and the elements that are transferred mainly concern the set of practical procedures to perform a task, rather than theoretical elements that allow you to understand the technical aspect. Consequently, in order to favour an expansion of the responsibilities and knowledge of the technician for destructive tests, it would be optimal to be able to use a qualification path such as the one being developed in the TRUST project.
- The level of entry into the qualification path cannot disregard a series of aspects related to the participant's previous technical and manual experience, since a lot of specific knowledge has been acquired by carrying out a large number of activities in one's

professional career often, they arose from training courses offered by the machine installers. Many technicians already carry out the job without having obtained recognition by means of a professional qualification.

- In order to have an easier implementation of the qualification path it would be important to give access to those who have a very low EQF but who have an aptitude for wanting to learn or have a strong previous practical experience.
  The knowledge of basic elements of English, computer science and materials science are considered essential to train a professional figure who matures a good level of autonomy and a good ability to deal with circumstances that have not occurred previously. This would also make it possible to have a resource capable of covering some tasks that, otherwise, would have to be assigned to an additional resource.
- The technical scenario presents a high level of heterogeneity of activities, technologies, in relation to the different applications and the different market segments in which a company operates. In order to make the most of the development of this qualification path, it is essential that the curriculum that is developed is very versatile and adapts as much as possible to the specific need of a company.

Finally, some specific topics can be drawn as in the following

- ***Activities the DT will be able to perform***
  - Execution of mechanical tests
    - Measurements of the specimens before the test and verification of the dimensional validity checks according to the applied standard test method
    - Measurements of the specimens after the test for the determination of further test results
    - Data analysis for the extraction the results of interest
    - Writing of a report, with all the information requested by the standard test method
  - Data analysis for the extraction the results of interest
  - Execution of metallographic tests
    - Etching of a macrographic section
    - Photographical documentation of the macrographic section
    - Measurement and identification of flaws on the welds and
    - Photographical documentation of the micrographic section and target zone verification (for fracture mechanics tests only)
  - Determination of uncertainty
  - Writing of a report, with all the information requested by the standard test method
- ***Access conditions to the DT training course***
  - Basic English to understand the standard test methods
  - Basic usage of spreadsheet software (e.g., Microsoft Excel) and Microsoft Word
- ***Approach of the course (theoretical and practical)***

- The theoretical lessons will cover a general overview of the standard test methods together with the engineering basis to understand them; furthermore, the execution techniques of the tests will be explored.
- The practical exercises will include practice for a correct use of the calliper to measure the specimens in order to validate them according to the dimensional tolerances cited in the standard test methods; furthermore, some mechanical and metallographic tests will be performed all together, as a working group, to get familiarity with the tests; finally the last practical part of the course will involve the students in the data analysis on pre-recorded raw data to determine the results requested by the standards.

8. Appendixes

IO1 – Proposal for questionnaire_IIS

Questions for VET providers:

Country

Name of the entity

Areas of Educational Offer

1. Do you receive requests for courses in Destructive Testing (DT) Technician?
2. Yes/No
   If Yes:
   a. How often?
      ❑ 0-5 times a month
      ❑5- 10 times a month
      ❑more than 10 times a month

   b. What is the average age of the applicants for DT training?
      ❑less than 25
      ❑25 to 35
      ❑more than 35

   c. What is the educational background of the applicants for DT training?
      ❑ less than EQF 4
      ❑EQF 4
      ❑EQF5
      ❑ More than EQF5

3. In your opinion, what shall be the minimum entry requirement(s) for effectively enrolling on the European DT Qualification, in terms of
   a. Education
      ❑EQF4
      ❑EQF5
      ❑EQF6

   b. Work experience
      ❑ No previous work experience or less than 1 year is not a limit
      ❑ 1-3 years' experience
      ❑ More than 3 years' experience

4. To which sector(s) do the companies asking for Destructive Testing courses belong?
   - ❑ Aerospace
   - ❑ Automotive
   - ❑ Naval
   - ❑Transports
   - ❑ Defence
   - ❑ Construction
   - ❑ Energy
   - ❑ Industrial equipment/tooling
   - ❑ Other (please specify) ___

5. Considering that this course would require a practical part, would you have the above equipment below to do it? Please select what equipment you have in house.

   - ❑Hardness test machine
   - ❑Tensile test machine
   - ❑Fatigue testing machine
   - ❑Impact testing machine
   - ❑ Optical microscope (OM)
   - ❑ Scanning electron microscope (SEM)
   - ❑Energy Dispersive X-ray Spectrometer (EDS)
   - ❑ No need to actually use any of them for the training

6. What do you think should be the required equipment for mechanical testing practical traning?
   - ❑ Tensile test machine
   - ❑Hardness test machine
   - ❑Fatigue testing machine
   - ❑Impact testing machine
   - ❑ No need to actually use any of them for the training
   - ❑ Other (please specify) ___

7. What do you think should be the minimum required equipment for metallography practical training?

   - ❑ Optical microscope (OM)
   - ❑ Scanning electron microscope (SEM)
   - ❑Energy Dispersive X-ray Spectrometer (EDS)
   - ❑ No need to actually use any of them for the training
   - ❑ Other (please specify) ___

8. What would be the suitable percentage of theoretical and practical training? (the first percentage referring to theoretical training)
   - ❑50-50
   - ❑60-40
   - ❑40-60
   - ❑70-30
   - ❑30-70
   - ❑Other (please specify)_____

9. What would be the subject matters addressed on theoretical training?
   - ❑ characterization of materials
   - ❑ mechanical properties
   - ❑ quality control
   - ❑use of equipment
   - ❑Other (please specify)_____

10. What materials the qualification should address?

    ❑ Steels
    ❑Copper
    ❑Aluminium
    ❑Nickel
    ❑Plastics
    ❑Composite
    ❑Others (please specify)___

11. In your opinion what are the skills needed by the attendees to attend the DT training smoothly?

    ❑Basics on material science and engineering
    ❑Information Technology Communication level basic
    ❑Information Technology Communication (ITC)level advanced
    ❑English level basic
    ❑English level advanced

Specific questions about the <u>VET Providers' Trainers</u>:

12. Do you consider your trainers to have the level of skills and knowledge that would allow them to implement the European Destructive Testing Technician Qualification?
    ❑ Yes
    ❑ No
    ❑ yes, for most of the topics

If no:
What kind of skills and knowledge should trainers have to implement the European Destructive Testing Technician Qualification?
____(open)
If yes,
Are their skills and knowledge about Destructive Testing in line with technological developments in this field?
    ❑ Their knowledge is up to date to the most recent developments
    ❑ Updating their knowledge is needed (please specify in what topics) __

13. In your opinion, what would be a proper methodology for training trainers in this field?
    ❑ Transfer of innovative practices on DT
    ❑ Practical examples/case studies
    ❑ Practical courses
    ❑ Simulation
    Other (please suggest)

Questions for technicians and employers
Country
Name of the company (not mandatory)

1. What's the size of the company?
    ❑ Small
    ❑Medium
    ❑ Large

2. In what sector does the company operate?
    ❑ Aerospace
    ❑ Automotive
    ❑ Naval
    ❑Transports

❑ Defence
❑ Construction
❑ Energy
❑ Industrial equipment/tooling
❑ Other (please specify) ___

3. This course would allow you to have a versatile professional figure to be employed in departments that need extra momentary support. Can this help on operations management perspective?
❑ Yes
❑ No. I would like to keep a separation between figures operating in either mechanical testing or metallography (for example for logistic reasons)

4. What are the activities that DT technicians perform in your company?
(please provide a list)

5. Have you ever been asked to demonstrate that you/or your employees have the right skills and knowledge to perform DT?
❑ Yes
❑ no

If yes, how often?
❑ Less than one a year
❑ Once every 1-2 years
❑ Once every 2-5 years
❑ Once every more than 5 years

6. What is the average age of technicians currently employed?
❑ Less than 25
❑ 25 to 35
❑ 35 to 50
❑ more than 50

7. Do you think the DT training and qualification can help with the handover of retiring workers?
❑ Yes
❑ No. I would manage the hand over in a different way. (Please specify how)_____

8. Considering the specimens you test, could you indicate which sector brings in the greatest demand?
❑ Aerospace
❑ Automotive
❑ Naval
❑ Transports
❑ Defence
❑ Construction
❑ Energy
❑ Industrial equipment/tooling
❑ Other (specify)

9. In addition to the coaching period, what training path do you submit to your new hires for the role of destructive test technician?

❑ Self-learning from education material they find externally
❑ Ask for them to participate to webinars
❑ Ask for them to participate to lectures that your own trainers are delivering for external attendees
❑ Organize a training at the company site delivered by external trainers
❑ Others, please specify

❑ None

10. Do the operators make decisions on the DT in addition to the execution of the test (for example on extra testing or updating the test setting parameters) ?
    ❑ Yes
    ❑ No, either the engineer or project leader makes the decision based on the testing output

11. Does the person in charge of carrying out the test also fill in the report?

    ❑ Yes
    ❑ No, either the engineer or project leader does

    If yes, to what extent?
    ❑Comments
    ❑Conformity assessment
    ❑Others (specify)

    If no, would you consider making the DT technician responsible for that, in consideration of the knowledge acquired through the DT qualification?

    ❑ Yes
    ❑ No, I am comfortable with either the engineer or the project leader keeping doing it

12. The course would allow you to significantly reduce the training period for new operators, saving resources; how long does this period last in your company on average for the role of destructive test technician?
    ❑ Less than 6 months
    ❑6 Months to 1 year
    ❑ More than 1 year

13. How would you implement the induction of DT technician if you had the chance to run in parallel the DT training qualification with the on-the-job-training? (the first percentage referring to DT training qualification)
    ❑50-50
    ❑60-40
    ❑40-60
    ❑30-70
    ❑70-30
    ❑Other (Please specify)_____

14. Do you have different operators in your company for mechanical tests and metallographic examinations of welded joints?
    ❑ Yes
    ❑ No

15. Which criteria do you apply for the recruitment of new destructive tests operators/technicians?
    ❑ I would prefer to hire a junior profile to train on the job
    ❑ I would prefer to hire someone with experience
    ❑ I would prefer to hire a junior profile, but to be trained through the DT qualification
    ❑ I don't have any preference

16. Assuming you are hiring a new operator, do you think that the DT qualification will be an added value for the selection of the candidate?
    ❑ Yes. Please specify why ___
    ❑No. Please specify why ___

17. Do you think it is important for a DT Technician to have Information Communication Technology (ICT) skills and knowledge to conduct his work? If yes, at what level?
    - ❑ Basic
    - ❑ Advanced
    - ❑ Proficient

18. What is the average education level of technicians currently employed for destructive tests?
    - ❑ less than EQF 4
    - ❑EQF 4
    - ❑EQF 5
    - ❑ More than EQF 5

19. What is the average number of years of work experience technicians currently working in destructive testing have?
    - ❑ 0-2 years' experience
    - ❑ 2-5 years' experience
    - ❑ More than 5 years' experience

20. What level of knowledge of technical standards do technicians currently employed for destructive testing have?
    - ❑ None
    - ❑ Basic
    - ❑ Advanced
    - ❑ Proficient

21. What level of knowledge of robotic systems do technicians currently employed for destructive tests have?
    - ❑ None
    - ❑ Basic
    - ❑ Advanced
    - ❑ Proficient

22. Do you think that technicians self-learning commitment is enough, or should/must they enrol in training?
    - ❑ They are motivated to keep themselves up to date with their attitude and passion for the job they do
    - ❑ Mandatory continuous training is essential

23. What are the specific destructive tests performed most commonly?
    - ❑ Tensile test
    - ❑ Fatigue test
    - ❑ Impact test
    - ❑ Hardness test
    - ❑ Fracture test
    - ❑ Shear test
    - ❑ Bend test
    - ❑ Others (please specify)_____

24. What do you think can be the added value of an operator qualification for destructive tests?

    - ❑ Develop technical background
    - ❑Give recognition for the competences developed
    - ❑Increase future job opportunities of the employee
    - ❑develop a professional profile which abilities are in line with harmonized guidelines

❑Other (Please specify)

TRUST IO Overall Feedback table of results

	IS		EWF		ISQ		ISIM		IIS	
Questions for VET providers:	8 VET Providers				8 respondents				8 VET providers	
1. Do you receive requests for courses in Destructive Testing (DT) Technician?	8									
Yes	4	50%	5	42%	5	63%	4	33%	4	50%
No	4	50%	7	58%	3	38%	8	67%	4	50%
If Yes:										
a. How often?	4									
0-5 times a month	4	100%	5	100%	4	80%	3	75%	3	75%
5- 10 times a month	0	0%	0	0%	0	0%	1	25%	1	25%
more than 10 times a month	0	0%	0	0%	1	20%	0	0%	0	0%
b. What is the average age of the applicants for DT training?										
less than 25	0	0%	0	0%	1	20%	1	11%	3	75%
25 to 35	2	50%	3	60%	2	40%	5	56%	1	25%
more than 35	2	50%	2	40%	2	40%	3	33%	0	0%
c. What is the educational background of the applicants for DT training?										
less than EQF 4	1	25%	0	0%	1	20%	2	22%	1	25%
EQF 4	2	50%	2	40%	3	60%	5	56%	3	75%
EQF5	0	0%	2	40%	0	0%	2	22%	0	0%
More than EQF5	1	25%	1	20%	1	20%	0	0%	0	0%
3. In your opinion, what shall be the minimum entry requirement(s) for effectively enrolling on the European DT Qualification, in terms of										
a. Education						0%	0	0%		
EQF4	2	50%	1	20%	5	100%	5	56%	6	75%
EQF5	1	25%	3	60%	0	0%	3	33%	2	25%
EQF6	1	25%	0	0%	1	20%	1	11%	0	0%
Below EQF4	0	0%	1	20%	2	40%	0	0%	0	0%

b. Work experience				0%						
No previous work experience or less than 1 year is not a limit	2	50%	1	20%	3	60%	2	25%	1	13%
1-3 years' experience	2	50%	3	60%	2	40%	5	63%	6	75%
More than 3 years' experience	0	0%	1	20%	3	60%	1	13%	1	13%
4. To which sector(s) do the companies asking for Destructive Testing courses belong?										
Aerospace	0	0%	0	0%	2	40%	1	13%	2	25%
Automotive	2	25%	3	60%	3	60%	2	25%	3	38%
Naval	0	0%	0	0%	1	20%	1	13%	2	25%
Transports	1	13%	2	40%	1	20%	1	13%	5	63%
Defence	0	0%	0	0%	0	0%	1	13%	3	38%
Construction	2	25%	4	80%	3	60%	1	13%	1	13%
Energy	0	0%	4	80%	2	40%	1	13%	1	13%
Industrial equipment/tooling	1	13%	1	20%	1	20%	2	25%	1	13%
Other Steel industry	1	13%		0%	1	20%	0	0%	0	0%
5. Considering that this course would require a practical part, would you have the above equipment below to do it? Please select what equipment you have in house.										
Hardness test machine	7	88%	8	80%	2	25%	8	100%	8	100%
Tensile test machine	7	88%	9	90%	4	50%	8	100%	8	100%
Fatigue testing machine	3	38%	4	40%	2	25%	2	25%	8	100%
Impact testing machine	7	88%	8	80%	2	25%	8	100%	4	50%
Optical microscope (OM)	5	63%	8	80%	4	50%	4	50%	6	75%
Scanning electron microscope (SEM)	4	50%	3	30%	2	25%	1	13%	2	25%
Energy Dispersive X-ray Spectrometer (EDS)	3	38%	7	70%	2	25%	1	13%	2	25%
No need to actually use any of them for the training	1	13%	2	20%	0	0%	0	0%	0	0%

6. What do you think should be the required equipment for mechanical testing practical training?										
Tensile test machine	8	100%	10	100%	7	88%	8	100%	8	100%
Hardness test machine	8	100%	9	90%	6	75%	8	100%	8	100%
Fatigue testing machine	4	50%	2	20%	5	63%	2	25%	8	100%
Impact testing machine	8	100%	8	80%	7	88%	8	100%	4	50%
No need to actually use any of them for the training	0	0%	0	0%	0	0%	0	0%		0%
Other (please specify) IS: machine for tribological testing (1)	1	13%	5	50%	1	13%	1	13%		0%
7. What do you think should be the minimum required equipment for metallography practical training?										
Optical microscope (OM)	8	100%	10	100%	6	75%	8	100%	8	100%
Scanning electron microscope (SEM)	4	50%	1	10%	4	50%	3	38%	2	25%
Energy Dispersive X-ray Spectrometer (EDS)	3	38%	1	10%	3	38%	3	38%	2	25%
No need to actually use any of them for the training	0	0%	0	0%	0	0%		0%	0	0%
Other specimen preparation	1	13%	2	20%	0	0%	0	0%	0	0%
8. What would be the suitable percentage of theoretical and practical training? (the first percentage referring to theoretical training)										
50-50	2	25%	3	30%	2	25%	2	25%	2	25%
60-40	1	13%	4	40%	2	25%	1	13%	2	25%
40-60	4	50%	2	20%	3	38%	4	50%	4	50%
70-30	0	0%	1	10%	0	0%	1	13%	0	0%
30-70	1	13%	0	0%	1	13%	0	0%	0	0%
Other (please specify)_____	0	0%	0	0%	0	0%	0	0%	0	0%

9. What would be the subject matters addressed on theoretical training?										
characterization of materials	8	100%	7	70%	8	100%	8	100%	8	100%
mechanical properties	8	100%	10	100%	8	100%	8	100%	8	100%
quality control	5	63%	9	90%	6	75%	6	75%	6	75%
use of equipment	6	75%	9	90%	7	88%	5	63%	8	100%
Other specimen preparation, references to regulations and standards	2	25%	0	0%	0	0%	1	13%	4	50%
10. What materials the qualification should address?										
Steels	7	88%	10	100%	8	100%	8	100%	8	100%
Copper	4	50%	1	10%	2	25%	4	50%	4	50%
Aluminium	7	88%	7	70%	5	63%	7	88%	6	75%
Nickel	1	13%	1	10%	2	25%	1	13%	2	25%
Plastics	4	50%	6	60%	5	63%	4	50%	4	50%
Composite	4	50%	3	30%	3	38%	2	25%	4	50%
Others depending on trainees needs	1	13%	0	0%	1	13%	1	13%	0	0%
11. In your opinion what are the skills needed by the attendees to attend the DT training smoothly?										
Basics on material science and engineering	8	100%	9	100%	5	63%	8	100%	8	100%
Information Technology Communication level basic	2	25%	2	22%	4	50%	2	25%	4	50%
Information Technology Communication (ITC)level advanced	0	0%	1	11%	2	25%	2	25%	0	0%
English level basic	6	75%	6	67%	2	25%	6	75%	4	50%
English level advanced	0	0%	0	0%	4	50%	2	25%	0	0%
Specific questions about the <u>VET Providers' Trainers</u>:										
12. Do you consider your trainers to have the level of skills and knowledge that would allow them to										

implement the European Destructive Testing Technician Qualification?										
Yes	5	63%	5	56%	1	13%	4	50%	8	100%
No	2	25%	2	22%	0	0%	2	25%	0	0%
yes, for most of the topics	1	13%	4	44%	7	88%	4	50%	0	0%
If no:						0%		0%		0%
What kind of skills and knowledge should trainers have to implement the European Destructive Testing Technician Qualification?										
____(open)	no answers				N.A.	#VALORE!	Material science			
If yes,										
Are their skills and knowledge about Destructive Testing in line with technological developments in this field?										
Their knowledge is up to date to the most recent developments	7	88%	8	89%	5	63%	6	100%	8	100%
Updating their knowledge is needed (please specify in what topics) __	1	13%	1	11%	3	38%	0	0%	0	0%
13. In your opinion, what would be a proper methodology for training trainers in this field?										
Transfer of innovative practices on DT	4	50%	1	11%	8	100%	4	50%	8	100%
Practical examples/case studies	7	88%	3	33%	8	100%	8	100%	8	100%
Practical courses	7	88%	4	44%	7	88%	8	100%	8	100%
Simulation	1	13%	0	0%	1	13%	2	25%	2	25%
Other (please suggest)	0	0%	1	11%	0	0%	0	0%	0	0%
Questions for technicians and employers	17 respondents				**55 respondents**				12 answers	
Country					Portugal, Angola, Brazil, Cape Verde, Mozambique		Romania			
Name of the company (not mandatory)										

1. What's the size of the company?	IS missed that question in questionnaire									
Small			6	43%	9	16%	1	13%	4	33%
Medium			5	36%	21	38%	3	38%	6	50%
Large			3	21%	25	45%	4	50%	2	17%
2. In what sector does the company operate?										
Aerospace	2	12%	5	36%	12	22%	1	13%	1	8%
Automotive	3	18%	7	50%	18	33%	4	50%	2	17%
Naval	1	6%	5	36%	15	27%	2	25%	2	17%
Transports	3	18%	7	50%	14	25%	2	25%	2	17%
Defence	2	12%	5	36%	0	0%	1	13%	4	33%
Construction	7	41%	10	71%	29	53%	7	88%	3	25%
Energy	5	29%	10	71%	22	40%	5	63%	2	17%
Industrial equipment/tooling	2	12%	7	50%	23	42%	4	50%	2	17%
Other Science, medicine, foundry, certification	6	35%	6	43%	14	25%	1	13%		0%
3. This course would allow you to have a versatile professional figure to be employed in departments that need extra momentary support. Can this help on operations management perspective?										
Yes	16	94%	8	73%	51	93%	10	100%	12	100%
No. I would like to keep a separation between figures operating in either mechanical testing or metallography (for example for logistic reasons)	1	6%	3	27%	4	7%	0	0%	0	0%
4. What are the activities that DT technicians perform in your company?										
(please provide a list)	Various answers, most, if not all of				**a) DT:** Tensile tests, Fatigue tests, Impact tests, Hardness tests, Fracture tests, Shear tests	#VALORE!			metallography, tensile, fatigue,	

	them mentioned: specimen preparation, conducting different tests, filling out reports.				and Bend tests **b) Other activities:** Technical assistance, Preventive and corrective industrial maintenance, Repair of submersible pumps, Maintenance of artesian holes (cleaning and installation of equipment), Flow tests, Rehabilitation of metallic reservoirs, Macrography, Boiler operations, Analysis and approval of the Inspection and Testing Plan and its follow-up, Inspections of suppliers' services and products, Verification of welds and cracks and Quality control				hardness, shear, bend	
5. Have you ever been asked to demonstrate that you/or your employees have the right skills and knowledge to perform DT?										
Yes	11	65%	6	50%	34	62%	6	50%	10	83%
No	6	35%	6	50%	21	38%	6	50%	2	17%
If yes, how often?				0%		0%				
Less than one a year	4	24%	3	25%	21	38%	4	36%	2	17%
Once every 1-2 years	6	35%	3	25%	4	7%	6	55%	6	50%
Once every 2-5 years	1	6%	0	0%	7	13%	1	9%	2	17%
Once every more than 5 years	0	0%	0	0%	2	4%	0	0%	0	0%
6. What is the average age of technicians currently employed?										
Less than 25	0	0%	0	0%	0	0%	0	0%	0	0%
25 to 35	8	47%	4	40%	25	45%	5	63%	4	33%
35 to 50	5	29%	5	50%	22	40%	2	25%	7	58%
More than 50	4	24%	1	10%	8	15%	1	13%	1	8%

7. Do you think the DT training and qualification can help with the handover of retiring workers?										
Yes	14	82%	10	100%	49	89%	8	80%	10	83%
No. I would manage the hand over in a different way.	3	18%	0	0%	6	11%	2	20%	2	17%
					a) Hiring young people looking for their 1st job; b)arranging sustainable solutions for the retirement of leaving workers; c)training solutions in the form of internships; d) replacing retiring workers with someone from the company (me included); e) Finding alternative ways by means of relocating workers given the fact that DT work is quite a small part of our work; f) proving adequate training to existing workers in-house	#VALORE!				
8. Considering the specimens you test, could you indicate which sector brings in the greatest demand?										
Aerospace	1	6%	2	20%	8	15%	1	13%	1	8%
Automotive	1	6%	3	30%	14	25%	1	13%	2	17%
Naval	0	0%	1	10%	7	13%	2	25%	2	17%
Transports	1	6%	0	0%	7	13%	1	13%	1	8%
Defence	0	0%	2	20%	1	2%	1	13%	1	8%
Construction	7	41%	6	60%	30	55%	2	25%	2	17%
Energy	2	12%	5	50%	17	31%	2	25%	1	8%
Industrial equipment/tooling	2	12%	5	50%	21	38%	4	50%	2	17%
Other (specify) IS: Science, Medicine, Metallurgy	3	18%	1	10%	5	9%	1	13%	0	0%

9. In addition to the coaching period, what training path do you submit to your new hires for the role of destructive test technician?										
Self-learning from education material they find externally	13	76%	4	40%	5	9%	5	63%	2	17%
Ask for them to participate to webinars	10	59%	2	20%	2	4%	5	63%	8	67%
Ask for them to participate to lectures that your own trainers are delivering for external attendees	3	18%	4	40%	7	13%	4	50%	8	67%
Organize a training at the company site delivered by external trainers	5	29%	2	20%	19	35%	6	75%	10	83%
Others, please specify IS: internal training (2)	2	12%	4	40%	10	18%	1	13%	0	0%
None	1	6%	1	10%		0%	0	0%	0	0%
					a) renewal of certification, b) on the job training c) Tutoring of apprentices by experienced workers until they reach the desired level of knowledge and proficiency d) if not possible to hire qualified personnel we would send the specimens to be tested to external contractors					
10. Do the operators make decisions on the DT in addition to the execution of the test (for example on extra testing or updating the test setting parameters)?										
Yes	9	53%	8	80%	15	27%	6	60%	8	67%
No, either the engineer or project leader makes the decision based on the testing output	8	47%	2	20%	40	73%	4	40%	4	33%

11. Does the person in charge of carrying out the test also fill in the report?										
Yes	10	59%	8	80%	43	78%	6	60%	8	67%
No, either the engineer or project leader does	7	41%	2	20%	12	22%	4	40%	4	33%
If yes, to what extent?										
Comments	7	70%	0	0%	25	58%	3	50%	8	100%
Conformity assessment	5	50%	6	75%	32	74%	4	67%	4	50%
Others: test parameters, used equipment, test results	2	20%	2	25%	5 a) Characterization of the sample material to be tested b) Need for repairs c) Equipment used d) Data on the test procedure (parameters, methodology applied, …)	0%	1	17%	2	25%
If no, would you consider making the DT technician responsible for that, in consideration of the knowledge acquired through the DT qualification?					a)					
Yes	5	50%	0	0%	5	42%	5	50%	1	25%
No, I am comfortable with either the engineer or the project leader keeping doing it	5	50%	2	100%	7	58%	5	50%	3	75%
12. The course would allow you to significantly reduce the training period for new operators, saving resources; how long does this period last in your company on average for the role of destructive test technician?										
Less than 6 months	8	47%	3	30%	20	36%	5	50%	7	58%
6 Months to 1 year	9	53%	4	40%	26	47%	5	50%	4	33%
More than 1 year	0	0%	3	30%	9	16%	0	0%	1	8%
13. How would you implement the induction of DT technician if you had the										

chance to run in parallel the DT training qualification with the on-the-job-training? (the first percentage referring to DT training qualification)										
50-50	3	18%	3	30%	16	29%	0	0%		0%
60-40	2	12%	2	20%	6	11%	0	0%	4	33%
40-60	1	6%	2	20%	10	18%	1	10%	1	8%
30-70	9	53%	1	10%	18	33%	8	80%	7	58%
70-30	1	6%	1	10%	5	9%	1	10%	0	0%
Other: no preferences	1	6%	1	10%	2	4%	0	0%	0	0%
14. Do you have different operators in your company for mechanical tests and metallographic examinations of welded joints?										
Yes	6	35%	4	44%	22	40%	3	30%	9	75%
No	11	65%	5	56%	33	60%	7	70%	3	25%
15. Which criteria do you apply for the recruitment of new destructive tests operators/technicians?										
I would prefer to hire a junior profile to train on the job	4	24%	2	20%	11	20%	3	30%	3	25%
I would prefer to hire someone with experience	9	53%	3	30%	17	31%	5	50%	3	25%
I would prefer to hire a junior profile, but to be trained through the DT qualification	0	0%	3	30%	12	22%	0	0%	6	50%
I don't have any preference	4	24%	2	20%	15	27%	2	20%	0	0%
16. Assuming you are hiring a new operator, do you think that the DT qualification will be an added value for the selection of the candidate?										

Yes	16	94%	7	88%	49 a) Accrued value of the qualification in terms of the acquired capacity to give response to new problems - higher autonomy in the work undertaken b) Support to the decision making process c) More educated reasoning in terms of the execution of the task in those cases where decisions need to be made d) Contributes to reducing the duration of internal training and adaptation period of the new worker e) Would make it possible to perform DT in-house in those cases where we currently need to have them made by external service providers f) Would increase the employee chances to progress in his/her career	91%	10	100%	6	50%

No	1	6%	1	13%	5 a) it would not cover other related necessary skills b) More confidence in in-house training by more experienced workers as a guarantee that all required knowledge and skills would be passed on	9%	0	0%	6	50%
	IS: Unfortunately, no one specified why.									
17. Do you think it is important for a DT Technician to have Information Communication Technology (ICT) skills and knowledge to conduct his work? If yes, at what level?			**8 answers**							
Basic	9	53%	1	13%	14	25%	5	50%	10	83%
Advanced	8	47%	7	88%	36	65%	5	50%	2	17%
Proficient	0	0%	0	0%	4	7%	0	0%	0	0%
18. What is the average education level of technicians currently employed for destructive tests?			**9 answers**							
Less than EQF 4	4	24%	2	22%	14	25%	2	20%	3	25%
EQF 4	5	29%	3	33%	21	38%	5	50%	8	67%
EQF 5	3	18%	3	33%	9	16%	2	20%	1	8%
More than EQF 5	5	29%	1	11%	11	20%	1	10%	0	0%
19. What is the average number of years of work experience technicians currently working in destructive testing have?										
0-2 years' experience	3	18%	0	0%	9	16%	2	20%	0	0%
2-5 years' experience	3	18%	4	40%	14	25%	3	30%	3	25%
More than 5 years' experience	11	65%	6	60%	32	58%	5	50%	9	75%

20. What level of knowledge of technical standards do technicians currently employed for destructive testing have?										
None	0	8%	0	0%	4	7%	0	0%	1	8%
Basic	3	18%	5	50%	28	51%	4	40%	2	17%
Advanced	13	76%	5	50%	20	36%	5	50%	8	67%
Proficient	1	6%	0	0%	3	5%	1	10%	1	8%
21. What level of knowledge of robotic systems do technicians currently employed for destructive tests have?										
None	4	24%	0	0%	55	100%	3	30%	3	25%
Basic	12	71%	8	80%	0	0%	5	50%	2	17%
Advanced	1	6%	2	20%	0	0%	2	20%	6	50%
Proficient	0	0%	0	0%	0	0%		0%	1	8%
22. Do you think that technicians self-learning commitment is enough, or should/must they enrol in training?										
They are motivated to keep themselves up to date with their attitude and passion for the job they do	6	35%	2	20%	4	7%	4	40%	8	67%
Mandatory continuous training is essential	11	65%	8	80%	50	91%	6	60%	4	33%
Other option ("further training is irrelevant for career progression	0	0%	0	0%	1	2%	0	0%	0	0%
23. What are the specific destructive tests performed most commonly?										
Tensile test	17	100%	8	80%	39	71%	10	100%	12	100%
Fatigue test	0	0%	2	20%	18	33%	1	10%	9	75%
Impact test	10	59%	7	70%	24	44%	8	80%	8	67%
Hardness test	13	76%	6	60%	32	58%	10	100%	10	83%
Fracture test	2	12%	9	90%	25	45%	4	40%	10	83%
Shear test	5	29%	3	30%	16	29%	2	20%	7	58%
Bend test	9	53%	8	80%	3	5%	4	40%	4	33%
Others (please specify)	0	0%	4	40%	1	2%	0	0%		0%

24. What do you think can be the added value of an operator qualification for destructive tests?										
Develop technical background	11	65%	6	60%	16	29%	6	60%	10	83%
Give recognition for the competences developed	11	65%	7	70%	1	2%	6	60%	9	75%
Increase future job opportunities of the employee	11	65%	4	40%	4	7%	7	70%	9	75%
Develop a professional profile which abilities are in line with harmonized guidelines	5	29%	8	80%	34	62%	6	60%	8	67%
Other (Please specify)			0	0%	0	0%		0%		0%

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Alignment between EWF Qualification System Framework and EQF (WELDING)

FIELD OF ACTIVITIY		EWF LEVEL	EQF LEVEL	KNOWLEDGE	SKILLS	AUTONOMY AND RESPONSIBILITY	EWF QUALIFICATION SYSTEM
INSPECTORS &SUPERVISORS/ COORDINATORS/MANAGERS	WELDERS & OPERATORS	EXPERT	7	Highly specialised and forefront knowledge including original thinking, research and critical assessment of theory, principles and applicability of metal additive manufacturing or welding related technologies.	Highly specialised problem- solving skills including critical and original evaluation, allowing to define or develop the best technical and economical solutions, when applying metal additive manufacturing or welding related technologies, in complex and unpredictable conditions	Manage and transform the metal additive manufacturing or welding and related technologies processes in a highly complex context. Fully responsible for the definition and revision of personnel's tasks.	WELDING
		ADVANCED	6	Advanced knowledge and critical understanding of the theory, principles and applicability of metal additive manufacturing or welding and related technologies.	Advanced problem-solving skills including critical evaluation, allowing to choose the proper technical and economical solutions, when applying metal additive manufacturing or welding and related technologies, in complex and unpredictable conditions	Manage the applications of metal additive manufacturing or welding and related technologies in a highly complex context. Act autonomously in decision making and definition in the definition of the metal additive manufacturing or welding and related personnel's tasks.	
		SPECIALIZED	5	Specialised, factual and theoretical of theory, principles and applicability of metal additive manufacturing or welding and related technologies	Specialised range of cognitive and practical skills, allowing to develop solutions or choose the appropriate methods, when applying metal additive manufacturing or welding and related technologies, in common/regular problems.	Manage and supervise common or standard metal additive manufacturing or welding applications and related technologies, in an unpredictable context. Take responsibility in standard work and supervise the metal additive manufacturing or welding and related personnel's tasks.	
		INDEPENDENT	4	Factual and broad concepts in the field of metal additive manufacturing or welding technology	Fundamental cognitive and practical skills required to develop proper solutions and application of procedures and tools on simple and specific metal additive manufacturing or welding problems.	Self-manage of professional activities and simple standard applications of metal additive manufacturing or welding and related technologies in predictable contexts but subject to change. Supervise routine tasks and similar function workers, as well as take responsibility for decision making in basic work.	
		BASIC	3	Basic facts, principles, processes and general concepts of welding, joining and related technologies	Be able to check and follow the information on the welding procedure specification, to produce butt and fillet welds in plates and or tubes, and or profiles in a variety of geometries and positions to the required quality and of specified dimensional accuracy	Work under supervision, taking personal responsibility for own actions and for the quality and accuracy of the work produced.	
		ELEMENTARY	2	Elementary principles of welding, joining and related technologies	Able to check and follow the information on the welding procedure or adhesive bounding specification, and to produce weld/joints in a variety of geometries and positions to the required quality and of specified dimensional accuracy	Work under supervision.	

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