NEW PROFESSIONAL QUALIFICATION

BUILDING DIAGNOSIS EXPERT

http://www.erasmus-diagnosis.eu
Erasmus+ Program. Ref.: 2017-1-ES01-KA203-038254
DIAGNOSIS
Innovating a crucial profession in building and construction sector in Europe

Intellectual Output O2: New Professional Qualification

New Professional Profile for the Building Diagnosis Expert

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Erasmus+ Program. Ref.: 2017-1-ES01-KA203-038254
Building Diagnosis Expert.
A new professional profile for building and construction sector in Europe

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Table of Contents

1. Introduction: the Project Diagnosis ................................................................. 5
2. Building a smart and sustainable Europe ....................................................... 6
3. National/regional qualifications framework (NQF) ............................................ 7
   3.1 The Spanish context ..................................................................................... 7
   3.2 The Polish context ..................................................................................... 9
   3.3 The English context .................................................................................. 10
   3.4 The Italian context ................................................................................... 13
4. Methodology .................................................................................................... 15
   4.1 Tools for data collection and analysis .......................................................... 17
5. Profiling the Diagnosis Expert: Comparative analysis ....................................... 19
   5.1 Diagnosis expert in a nutshell ..................................................................... 19
   5.2 Diagnosis expert educational background .................................................... 19
   5.3 Diagnosis expert: skills and competences in action at work ......................... 20
   5.4 Diagnosis expert: innovativeness of the profile ........................................... 21
6. A new professional profile for building and construction sector in Europe .......... 22
7. Mapping the key competences of the Diagnosis Expert; inputs for Education stakeholders ................................................................. 28
8. Creating a new professional qualification .......................................................... 33
9. Conclusions ...................................................................................................... 35
Updated bibliography and webliography ............................................................... 37
National/regional qualifications framework (NQF) ............................................... 38
List of figures ..................................................................................................... 39
1. Introduction: the Project Diagnosis

Building and construction sector in Europe is one of the sectors which suffered most the economic crisis in these last few years, and where for many reasons innovation and upgrading of competences is still difficult to develop, especially in relation to diagnosis processes. Especially in relation to diagnostic approaches and methodologies it is possible to recognize a common emerging need at European level, generated by the lack of available skilled profiles.

Starting from this context, the project general aim is to deepen knowledge about existing up-to-date technological tools for building assessment through the collaboration among international partners, and consequently to upgrade existing training tools and professional qualifications curricula in order to create a renewed professional profile in building and construction sector. With core competences related to the governance of the diagnostic processes.

DIAGNOSIS project also intends to meet Europe 2020 growth strategy priorities on employment and education. The project takes into account also the EU Roadmap Opening up Education (04/2013) enhancing education and skills development through new technologies and underlining “insufficient supply of quality digital contents across languages, subjects and needs”.

More in details, the present intellectual output (IO2), aims at proposing a shared reflection regarding the skills and competences set that the diagnosis expert is asked to possess in order to face the new professional challenges at work, both “managerial” and technical.

The output could be a useful tool for stakeholders’ debate around a crucial professional profile able to manage innovation processes in the building and construction sector.

More info at the project's website and under QR code:

http://www.erasmus-diagnosis.eu/
2. Building a smart and sustainable Europe

The disruptive digitalization of the different phases of the building and construction processes, has been transforming the morphology of buildings and constructions, from design to realization, using BIM, applying novel techniques and adopting advanced materials and manufactures for energy qualification and requalification of buildings themselves. The increasing emergency related to the management of climate change, speeding the transition to a green economy, also impacts on building and construction sector. The increasing risk of natural disasters can compromise structures and infrastructures, requesting climate-proofed, secure, safe, and resilient buildings: under this framework, the diagnosis process becomes crucial, as well as the role played by diagnosis experts.

Moreover, the transition to a circular economy boosted by the European Smart Specialization Strategy, asks for green innovation, recycle and reuse of materials, reduction of waste production and adequate management: In few words, “it is necessary to switch to holistic renovation, that ensures that other problems are solved during deep renovation, resulting in structurally sound, healthy, accessible and energy efficient buildings”, [FIEC, Construction Manifesto for Action, EU Term, 2019-2024].

Furthermore, this complex and multifaceted evolution implies availability on the international labour market of new professionals able to support this innovation processes, both at technical and managerial point of view. In line with the finalities of the “European Initiative “New Skills for new Jobs”, the rapid evolution of the socio-economic contexts and the globalization of the economy itself ask for new profiles able to manage this complexity. In other words, the prior challenge for Educational institutions is the innovation of curricula and training programmes in order to make prepared students/trainees, future professionals, available as requested by companies and by the global labour market.

This intellectual output, result of a Strategic Partnership managed within the Erasmus Project DIAGNOSIS, assuming the above-mentioned disruptive changes, aims at providing a contribution to recognition of key emerging professional profiles in the building and construction sector, with special reference to the building diagnosis processes for a smart and sustainable Europe.
3. National/regional qualifications framework (NQF)

3.1 The Spanish context\(^1\)

In 2018, the Spanish Ministry of Education and VET, in cooperation with other stakeholders, concluded technical work on the design of the Spanish qualifications framework for lifelong learning (Marco Español de Cualificaciones MECU)\(^2\).

The qualifications framework for higher education (Marco Español de Cualificaciones para la Educación Superior (MECES)) has been put in place separately\(^3\). This framework has been self-certified against the framework for qualifications of the European higher education area (FQ-EHEA) as part of Spain’s continuing commitment to the Bologna process (Ministry of Education, Culture and Sport, 2014).

Through the MECU it should be easier to identify, validate and recognise all kinds of learning outcomes (including non-formal and informal learning), regardless of the way they were acquired.

The purpose of MECES is to allow the classification, comparability and transparency of higher education qualifications within the Spanish education system. The levels within MECES are labelled 1 to 4 and correspond to the four levels of the FQ-EHEA: técnico superior (advanced VET), grado (bachelor), master (master) and doctor (doctorate). Of these, the first is a non-university higher education level included to support and promote lifelong learning. Some advanced vocational education and training (VET) is considered higher education (HE) but is undertaken outside the university system; such advanced VET studies may be recognised not only for admission to university but also as ECTS credits where subjects/learning outcomes are properly aligned.

The MECU aims to include, in a first stage, all nationally recognised diplomas and certificates from the education and labour ministries, while remaining open for inclusion of official qualifications issued by other administrative sectors.

The four highest levels are compatible with the Spanish qualifications framework for higher education, based on the Dublin descriptors. Level descriptors are defined in terms of knowledge, skills and competences. They have been inspired by EQF level descriptors, but adopted to suit the national context. The Spanish Ministry of Education and VET drafted a new education organic law in 2018 that would be submitted to Parliament in spring 2019 (not yet submitted due to the political instability situation in Spain). The law aims to improve the quality of teaching and learning, and increase school autonomy and the coherence of the national system in line with international standards.

The level of implementation also varies across subsystems; the most developed and elaborated is in VET. The VET qualification system is defined by the Law on qualifications and vocational training that establishes the national catalogue of professional qualifications

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\(^1\) The text below is a summary transcript of the document Spain - European inventory on NQF 2018

\(^2\) MECU: Spanish national qualification framework for lifelong learning
http://www.mecd.gob.es/educacion-mecd/mc/mecu/presentacion.html

permanently updated. Learning outcomes are closely related to work activities and required professional competences.

New higher education study programmes have to include expected outcomes and achievement of learning objectives set for the student. All study programmes have to be accredited according to national guidelines. MECES refers directly to learning outcomes (resultados de aprendizaje and competencias).

Regional councils for education have been involved. Spain is seeking to create a simple and practical system that is robust, but also flexible enough to respond to the requirements of regional autonomy. However, overall responsibility for the development and implementation of the MECU, in accordance with the Spanish constitution, lies with central government. The State has exclusive competence on all regulation of qualifications, an aspect correspondingly developed and revised by the 2006 and the 2013 Organic Acts.

External quality assurance in higher education is undertaken by the national agency (ANECA) and a number of agencies within some of the autonomous regions.

In recent years, the Spanish Government and regional governments have consolidated national procedures for the validation of non-formal and informal learning; different laws and regulations frame validation, targeting different education sectors. Royal Decree 1224/2009 established recognition of skills acquired through work experience.

Awareness of validation has increased in all sectors of society in Spain and stakeholders have become more sensitive to validation as a way of recognising learning outcomes acquired in non-formal and informal contexts, and through work experience. Validation is now covered by the Spanish Strategy for employment activation 2017-20 and a project Reconoce is in process to cover validation in the entire youth sector.

The MECU is not yet operational. The royal decree on its introduction will establish the legal basis for its implementation. The draft Royal Decree on MECU planned to be adopted in 2019 recommends establishing a MECU committee, including stakeholders such as ministries, representatives of professional associations, trade unions and business representatives, and qualifications framework experts from different sectors.

The committee will be mandated to decide on assignment of framework levels to the Spanish qualifications and to submit proposals to the government for approval. The national qualifications will be assigned to MECU levels based on three criteria:

- comparability of qualification type descriptors defined in learning outcomes and the MECU level descriptors;
- implementation of the common quality assurance criteria for qualification in line with annex IV of the 2017 EQF recommendation.
- public consultation with bodies involved in the design, award and use of qualifications in a respective field.

Development of the Spanish national qualifications framework for lifelong learning (MECU) aims to strengthen the links between education and employment but there are various challenges at different levels. Dialogue and interaction with different stakeholders from education and employment needs to continue; involving administrations that provide and award qualifications in different sectors will be part of the implementation process of the MECU. Government is taking initiatives to support cooperation between universities, businesses and research centres.
Further application of MECES is an integral part of both external and internal quality assurance mechanisms undertaken within Spanish higher education, nationally and within the autonomous regions. NQF development in Spain also shows the importance of political processes and cycle on the implementation of European tools, such as the EQF.

3.2 The Polish context

The Polish Qualifications Framework (PQF) is a reference system for qualifications awarded in Poland, to allow Polish system of education be comparable with EU education system. The regulations were established by Polish Parliament by the Act on Integrated Qualifications System, from 22 December 2015. There are 8 levels in the PQF, related to the full and partial qualifications, namely4:

Full qualifications:
- 1st – 5th Levels of PQF – like for example: certificate of completion of a six or eight year primary school, lower secondary school graduation certificate, diploma confirming vocational qualifications, graduating from the technical upper secondary school or postsecondary school, after graduating from the second-cycle upper secondary trade school, Teacher Training College graduation certificate, Teacher Training College of Foreign Languages graduation certificate, Social Workers College graduation certificate, etc.;
- 6th level of PQF is related to first-cycle studies graduation diploma;
- 7th level of PQF is confirmed by second-cycle studies graduation diploma and uniform master’s degree diploma;
- 8th level of PQF is confirmed by doctoral certificate.

Partial qualifications:
- qualifications of the professions included in the classification of vocational education;
- qualifications confirmed by master craftsman’s diplomas and the journeyman qualifications;
- qualifications awarded after completing post-graduate studies;
- qualifications awarded after completing other forms of university education, Polish Academy of Sciences institutes and research institutes;
- regulated qualifications (like for construction professions) – established by separate regulations, the broadcasting of which takes place on the principles specified in these regulations, excluding qualifications awarded in the education system and the higher education system;
- market qualifications – not regulated by legal regulations, the transmission of which takes place on the basis of freedom of economic activity (like managerial qualifications given by PSMB – Polish Association of Building Managers)

In relation to PQF, special Sectoral Qualification Framework is being created in Poland, which shows regulations related to specific industry – created by industry for industry. At the moment (September 2019) eight proposals were established and are under the process of review: Banking, Information Technologies, Sport, Tourism, Telecommunication, Development Services, Fashion and Construction.

4 http://www.kwalifikacje.gov.pl/polska-rama-kwalifikacji
In terms of construction industry SQF developed its definition: "Construction is the type of material service, creating new building objects. Construction result is permanent. Construction investment process is divided into four phases:

1. Preparatory of investment, design, legal and administrative works;
2. Construction and take-over of the building object;
3. Maintenance of the object to achieve proper technical conditions;
4. Demolition of the object."

In DIAGNOSIS Project context, in terms of phase:

1 – Planning: not only construction is taken under consideration but also maintenance, refurbishment, extension of the object is discussed, in terms of phase
2 – Construction: technology and techniques of construction site, in terms of phase
3 – Maintenance: all qualifications related to proper maintenance and conservations of existing building objects, in term of phase
4 – Demolition: all works related to demolition, including waste management. All four elements / phases in construction definition, which is the base for future SQF for Polish construction, are also related to soft skills (like legislation, negotiation theory) and technical managerial skills (like BIM, cost, time, quality management).

3.3 The English context

The qualifications system that applies in England, shares many features with those in Wales and Northern Ireland. These similarities reflect many years of close working between the three systems in what was a de-facto single market. However, qualifications policy has diverged to some extent over recent years.⁵

A large number of separate qualifications are available for use in both general and vocational learning outside of higher education. These qualifications are designed to give a reliable indication of an individual’s knowledge, skills or understanding and are only awarded to those who have demonstrated a specified level of attainment. They are used to certify the achievements of individual learners in schools, further education colleges and work-based learning. They also form a major component of accountability systems.

The role of the statutory examinations regulator for England (Ofqual) and of awarding organisations and centres. It also provides information on the Regulated Qualifications Framework (RQF), which replaced the National Qualifications Framework (NQF) and the Qualifications and Credit Framework (QCF) in October 2015. The final sections of the article briefly address the alignment of the RQF with the Framework for Higher Education Qualifications (FHEQ) and the European Qualifications Framework (EQF), and the regulation of professional qualifications.

Qualifications regulation
The Office of Qualifications and Examinations Regulation (Ofqual) is the independent regulator of qualifications, examinations and assessments in England. It was established as a non-ministerial government department in April 2010.

⁵ Adapted from European Union EURYDICE https://eacea.ec.europa.eu/national-policies/eurydice/content/national-qualifications-framework-93_en
Ofqual ensures that the qualifications market in England is fit for purpose by:

- recognising awarding organisations to offer regulated qualifications and checking that the organisations meet Ofqual's Criteria for Recognition
- holding awarding organisations to account on an ongoing basis, by requiring them to have in place appropriate systems, processes and resources as explained in the Ofqual Handbook: General Conditions of Recognition
- in some circumstances, establishing and upholding criteria which specified qualifications must meet
- maintaining a register of all regulated qualifications - the Register of Regulated Qualifications - and reporting publicly on these qualifications and on the organisations that offer them
- considering and monitoring risks to qualifications standards
- researching, gathering evidence and investigating issues and taking enforcement action where appropriate and proportionate.
- Regulated qualifications intended for learners under the age of 19 must also be approved by the Secretary of State for Education, under Section 96 of the Learning and Skills Act 2000, in order to be eligible to receive public funding.

Regulated qualifications intended for learners aged 19 and over must also be approved by the Education and Skills Funding Agency (ESFA) in order to be eligible to receive public funding.

Awarding organisations
Qualifications are provided by awarding organisations (AOs), which are external to the education or training provider. AOs are private companies, with either commercial or charitable status, funded mainly by examination fees. They develop and deliver qualifications to meet government policy requirements and changing skills requirements and to respond to market demand. Awarding organisations must gain recognised status from the qualifications regulator Ofqual (see the subheading ‘Qualifications regulation’ above) before they can propose qualifications for accreditation.

The principal roles of awarding organisations are:

- designing and developing qualifications
- approving and monitoring centres to offer qualifications to the standards required
- ensuring assessment is carried out in a way that is fair, valid and reliable and conforms to the rules that all awarding organisations and their qualifications must meet
- ensuring equality of access to qualifications
- awarding qualifications to learners who have met the qualification requirements.
- The Annual Qualifications Market Report (England, Wales and Northern Ireland) provides statistics on the number of recognised awarding organisations offering qualifications, the qualifications available and the numbers awarded.

The Joint Council for Qualifications (JCQ) is a central body for the seven largest awarding organisations in the UK. It provides common regulations setting out the key administrative requirements and referencing the national agreements on the conduct of general qualification exams and assessments, and outlines special arrangements for individuals with particular requirements.

The majority of the 158 awarding organisations across the UK which deliver regulated qualifications provide vocational qualifications.
Four awarding organisations – AQA, Eduqas (WJEC), OCR and Pearson – offer GCSEs and A Levels (general qualifications offered in schools and colleges) to meet Ofqual's requirements. Also known as exam boards, these awarding organisations were originally established as consortia of universities providing common entrance examinations on a regional basis. This system has since given way to a more open market, in which schools' and colleges' choice of awarding organisation is strongly influenced by accountability measures and funding considerations.

Centres
Centres, sometimes known as examination centres, conduct the examinations and assessments set by awarding organisations. In most instances, centres are schools and colleges, although they may also be training providers, adult education centres, offender learning units or employers.

Centres choose which awarding organisation(s) to work with and must be recognised by these to deliver their qualifications. They must have sufficient resources, expertise, and organisational and administrative processes to support and assess learners to the standards required. Centres are responsible for internal quality assurance and must make their systems, processes and practices available for inspection and review by the awarding organisation.

Reform of GCSEs and A Levels
Until September 2015, England, Wales and Northern Ireland shared qualifications frameworks, and the five principal exam boards offering general qualifications across all three jurisdictions were AQA, Pearson, OCR, WJEC and CCEA. Centres in England were free to choose which qualifications to offer from these exam boards.

However, qualifications policy has since diverged. In England, both the qualifications framework and general qualifications (GCSEs and A Levels) have been reformed. Alongside this, a 2012 Welsh Government review of the qualifications system for 14- to 19-year-olds concluded that a single system was no longer appropriate.

Reformed GCSEs and A Levels began to be introduced in England, Wales and Northern Ireland in September 2015. These reformed qualifications are designed to comply with the specific regulatory regime which applies in their target market, as set by Ofqual in England, Qualifications Wales in Wales, and CCEA in Northern Ireland.

In England, the first new qualifications were awarded to students in 2017. This summer (2019) represents a major milestone in the reform process because the qualifications awarded to students in all but a few subjects will be new.

Regulated Qualifications Framework
The Regulated Qualifications Framework (RQF) is the regulatory qualifications framework for England. Qualifications accepted for use by Ofqual are placed on the Register of Regulated Qualifications, with information on their level and size to indicate their position on the RQF. The Register also includes qualifications regulated by the qualifications regulator in Northern Ireland.

Within the RQF, the level and size of each qualification is determined as follows:

The level of a qualification is based on the generic knowledge and skills a learner will be able to demonstrate once they have achieved that particular qualification. Qualifications may be assigned one of a range of levels, from Entry Level 1 (which is the most basic in terms of the outcomes required) through to Level 8 (the most advanced). The level descriptors associated
with each level within the RQF can be found in the Section E of the Ofqual Handbook, Design and development of qualifications.

The size of a qualification is expressed in hours. This is known as the ‘total qualification time’ (TQT). TQT is the estimated number of hours that learners would typically be expected to take in order to achieve the level of attainment necessary for the award of a particular qualification. TQT includes ‘guided learning hours’ (GLH), which is time spent by a learner being directly taught or instructed by a lecturer, supervisor or tutor, and the number of hours a learner might be likely to spend in preparation or study not undertaken under the immediate supervision of a lecturer or tutor. Should an awarding organisation wish to assign credit to a qualification or units of a qualification, this is calculated by dividing TQT by 10. Further information about the criteria awarding organisations must apply when describing the size of a qualification is given in the Ofqual Handbook.

Adapted from UK ReferNet (Vocational Education and Training in Europe – United Kingdom, 2016, p. 12).

The Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies (FHEQ) (2014), is a five-level framework for higher education qualifications. The levels, designated 4–8, are comparable to Levels 4–8 of the RQF. The FHEQ is described in further detail in the ‘Introduction’ to the higher education chapter.

Professional qualifications
Qualifying for many higher-level occupations in the UK involves gaining qualified status through professional membership of regulatory bodies. This qualified status normally takes the form of a membership designation or a chartered or accredited title rather than a certificate or diploma. As such, it is outside the scope of the qualifications frameworks described in this article. However, many professions use qualifications within the national frameworks as part of their routes towards qualified status.

3.4 The Italian context

The national qualification framework (NQF) for higher education is the result, with reference to the Italian scenario, of a complex process and context, “governed by multiple legislation on competencies”i both at regional and national level. Definitely, in recent years, legislative initiatives led to important steps forward because of:

More effective stakeholders’ involvement, such as industries from all the most important sectors;
The introduction of the learning outcomes approach both at academic and non-academic – vocational training– level;
The growing importance of the higher technical education and training pathway (Istruzione e formazione tecnica superior, IFTS and Istruzione Tecnica Superiore, ITS).

“In vocational training, where the regions have main responsibility, there is a focus on competencies, which are described in terms of learning outcomes”ii. Moreover, IFTS and ITS “lead to a diploma and qualification acknowledged at national level”.iii

The vocational training (ITS and IFTS) within the Italian higher education system has taken on an increasingly important role in the completion of the third level training offer at national level for all the market sectors, including the construction sector as well. Vocational training paths often bridge the gap between the evolution of skills needs, expressed by different market actors, and the national academic supply.
In fact, the analysis conducted on the degree courses related to the project issues have shown, as already mentioned, a general gap between the educational offers of paths related to diagnostics, especially with reference to the existing building.

Definitely, both in the field of engineering and architecture degree courses and in the post-graduate offer, the themes of diagnostics applied to the existing building are almost related to specific areas such as energy efficiency and structural or seismic safety.

Even the issue of the digitization of the construction sector is not yet a sufficient driver for the training courses updating, when compared to market requirements.

Consequently, vocational and educational training (VET) paths play an important role in DIAGNOSIS project, with reference to the Italian context, as well as in order to test and verify project outputs.

The analysis of the National Qualifications Framework in the construction sector showed that less than 10% of national qualifications are related to building diagnostics. This percentage falls below 5% with reference to the existing built heritage. Moreover, and with reference to the competence identified as the priorities in this project, there is no dedicated path, based on a holistic and integrated approach, for professional training in this knowledge field and skills applied to the recovery and rehabilitation processes.

Some important innovations have been introduced in existing qualifications. This is the case, for example, of the qualification of "Building Designer", which was joined in Emilia-Romagna by the qualification of "BIM Modeling Technician", because of the growing importance of digital tools for the representation of the buildings' life cycle. However, this knowledge remains confined to some specific phases of the building production process, mainly the phase of project representation, rather than the systematic collection and sharing of all the knowledge about the existing buildings; an important phase that should systematically precede the intervention on the existing buildings.

In this context, other qualifications can be cited as important signs of a process of change, even if slow, in the direction of a greater importance of diagnostic issues for the sector.

These include:
- Expert technician in seismic vulnerability assessment;
- Expert technician in concrete diagnostics for the safety of the building and the environment;
- Expert technician in the assessment of the sustainability of construction processes;
- Expert technician in structural diagnostics and monitoring;
- Expert technician in acoustics.

However, all these pathways and qualifications still represent a limited area, compared to the rapid growth of the recovery market and the consequent demand for specialised and interdisciplinary skills for the assessment of the state of the art of the existing built heritage.
4. Methodology

The present intellectual output aims at boosting a debate and a consequent common reflection on an emerging professional profile operating in the building and construction sector, identified by the partners (ES; IT; PL; UK) as the so-called “Diagnosis Expert”. The output presents the results of a shared qualitative analysis realized by the partners at national level, taking into account the peculiarity of the different national contexts, characteristics and structures of the national Education systems, with particular reference to Faculties and tertiary paths connected to the building and construction sector (Architecture, Engineering). Finally, the peculiarities of the national sectoral labour market (including employment rate and dynamics, workforce mobility rate, entrepreneurial tissue, job demand, etc.) have been also analysed.

The expertise of each partner and the direct involvement of the relevant public and private actors in periodical multi-stakeholders tables, called Resonance Groups, (n. 4/each country during the project lifetime), for widening the debate and boosting the direct engagement at local/regional level, have supported the implementation of the activity and represented a stronghold of the adopted qualitative methodology.

Referring to the designed and shared common technical tools for proceeding with the recognition and collection of relevant information concerning the description of the emerging role of the Diagnosis Expert, the partners adopted the template reported in the following pages (section 2.1). The structure of the template and its key items have been thought for supporting the role and job description, propedeutical to the identification of the key competences. As for the selected indicators and reference frameworks, EQF standard as well as ECVET system have been privileged, in line with the general approach followed within the project Diagnosis.

The collected information has been analysed in order to put in evidence similarities, common emerging knowledge and abilities connected to the key role of Diagnosis Expert and peculiarities/distinctiveness depending on the national context.

For each item of the templates completed by the partnership, a comparative analysis has been made and proper comments to the outcomes have been foreseen in order to provide a methodological document useful for supporting the debate on the innovation in the diagnostic processes of the buildings.

Finally, in relation to the project structure, the present intellectual output represents an input for intellectual Output 3 – Syllabus and capitalizes the body of knowledge developed by intellectual output 1, as the following Figure1 shows:
Innovating a crucial profession in building and construction sector: the diagnosis expert.
4.1 Tools for data collection and analysis

For realizing the data collection at country level, partners shared an ad hoc template aimed at photographing the overall situation at “present” time combining 1) state of the art of the sectoral context, in order to identify new spaces for emerging profiles and sectoral experts requested at market level, in order to be able to profile the novel qualification.

**TEMPLATE METHODOLOGICAL NOTE:**

Please, mind that in the completion of the following template, you could refer to a) an entire professional profile to be described or to b) some key competences identified analyzing different kind of sources that could be relevant for the output. In case “B”, indicate the original source of the described standard.

<table>
<thead>
<tr>
<th>DESCRIPTION OF THE PROFESSIONAL PROFILE/QUALIFICATION</th>
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<td><strong>DENOMINATION OF THE PROFESSIONAL QUALIFICATION/TECHNICAL PROFILE/STANDARDS OF COMPETENCES</strong></td>
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<td><strong>BRIEF DESCRIPTION OF THE PROFESSIONAL QUALIFICATION/TECHNICAL PROFILE</strong></td>
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<td>(Explain the main activities managed by the profile)</td>
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<td><strong>IN COMPANY ROLES</strong></td>
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<td>(In the private or public organizations, what kind of technical profiles managed the activities the new profile would be in charge for?)</td>
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<tr>
<td><strong>KEY COMPETENCES OF THE PROFILE</strong></td>
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<td>(List the key competences necessary to implement activities and play the professional role)</td>
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<td><strong>INNOVATIVENESS OF THE PROFILE</strong></td>
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<td>(Explain the innovativeness of the profiles in terms of new abilities and knowledge)</td>
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<td><strong>DOCUMENTATION</strong></td>
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<td>(Indicate formal documentation, studies, researches, other sources you have used)</td>
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# Detailed Description of the Key Competences of the Profile

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<tr>
<th>UNIT</th>
<th>KNOWLEDGE</th>
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<th>PERFORMANCE INDICATORS</th>
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**Expected Output/Results**

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**Expected Output/Results**

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**Expected Output/Results**

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5. Profiling the Diagnosis Expert: Comparative analysis

5.1 Diagnosis expert in a nutshell

Project partners have described the new professional profile as follows:

A Diagnostic Expert is an expert who can dialogue with owners of existing buildings or their representatives and at the same time with building and construction professionals, being the one who can use up-to-date technologies to analyse the building, detect and explain the needed interventions (i.e. for earthquakes prevention, for improving energy, structural and environmental comfort etc). Such an expert could (when having specific socio-psychological and technical competences) inform and guide owners and building managers in planning interventions through an aware and informed decision based on real data on their specific building.

If not having the specialist technical knowledge to be competent to report on the complexity of some building elements, diagnostic expert is able to recognize the limits of his own competence and to refer to appropriate experienced experts, when needed.

5.2 Diagnosis expert educational background

The elaboration of collected information and data, described the Diagnosis Expert as a high skilled professional, with a structured educational background, degrees and expertise, achieved through formal and non-formal opportunities.

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<tr>
<th>COUNTRIES</th>
<th>“Diagnosis expert” is a graduate in architecture or engineering who expanded his knowledge by undertaking postgraduate studies, where there is a possibility of deepening knowledge in the fields of building diagnosis, extensive knowledge from different fields about the latest investigation for analysis and buildings repair techniques.</th>
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<td>Spain</td>
<td>A diagnosis expert has a very important function and must possess not only knowledge of legal regulations or basic research techniques which he/her has learned during studies or trainings, but also must constantly expand his/her knowledge by undertaking postgraduate studies where there is a possibility of deepening knowledge in the field of detailed construction diagnostics. Currently, the diagnosis expert is a person who has extensive knowledge from different fields about the latest investigation and repair techniques. He/she is a person who has a knowledge in other disciplines and in many cases, as well as he must be able to communicate with specialists from various fields.</td>
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### United Kingdom

The technical profile of the “Diagnosis expert” is a graduate in architecture, architectural technology, building engineer, building or engineering who expanded their knowledge by undertaking postgraduate studies, where there is a possibility of deepening knowledge in the fields of building diagnosis.

The diagnosis expert is a professional who has extensive knowledge from different fields about the latest investigation for analysis and buildings repair techniques.

### Italy

The technical profile of the “Diagnosis expert” is either a graduate in architecture or engineering or a professional with a higher technical education diploma (ITS-IFTS) who expanded his/her knowledge by undertaking post diploma studies, where there is a possibility of deepening knowledge in the fields of building diagnosis, with particular reference to the existing buildings recovery sector.

The diagnosis expert is a professional who has both technical and managerial knowledge, from different fields, which make the managing of a complex project effective.

### 5.3 Diagnosis expert: skills and competences in action at work

In relation to the role managed by the Diagnosis Expert within companies or organizations, available data profile a figure able to assure the governance of entire diagnostic processes according to a holistic approach to construction as well as conservation and maintenance of existing heritage, reporting to other professionals or directly to commitments.

#### IN COMPANY ROLES

(In the private or public organizations, what kind of technical profiles managed the activities the new profile would be in charge for?)

- Pre-diagnosis for a homogeneous evaluation of buildings as a whole, or parts of them. This diagnosis could be used also as a help when selling or buying a property. Example of a client: Administrations, large owners, private owners
- Punctual report on specific damages and repair of failures (simple or complex) or preventive maintenance. Example of a client: Private owners, Administrations
- Diagnosis of a building, prior to a rehabilitation project. Example of a client: Designer or developer.
5.4 Diagnosis expert: innovativeness of the profile

In line with the results of the analysis that show an expert able to put into action a wide, multifaceted and complex capability set, all partner organizations have described the profile as one with a great innovation potential. In fact, the Diagnosis expert must be able to identify innovation, facilitating its embedding in intervention processes; applying novel techniques and tools.

- Complex knowledge including outside rules and regulations as well as national standards
- Mastery many disciplines is required (structures assessment, energy efficiency evaluation, graphical survey, traditional materials, construction systems, laboratory analysis, chemical analysis, etc.)
- Knowledge of new diagnosis techniques, including the newest non-destructive ones
- Survey modelling (BIM) - application of new skills and strategies for process management as well as using integrated technologies to support both productivity and innovation through the construction sector digitization
- Management and coordination of experienced experts in different specialties when needed.
6. A new professional profile for building and construction sector in Europe

The emerging profile of the Diagnosis Expert is a high skilled profile with a wide panel of complex skills both hard and soft. From the analysis and elaboration of the different data collected by partners at national level, a possible representation of the skills set of the new professional can be the following:

![Diagram showing the skills set of a Diagnosis Expert]

Starting from clusterization, it is possible to decline each macro-typology of skills as follows:

- **Management skills**: Business decision-making, Business improvement, Organizational and leadership, Risk management, Project planning and management, Stakeholder engagement
The Diagnosis Expert is a professional with a set of managerial skills necessary for planning activities, in relation to coordination of teams and multidisciplinary teams, to plan resources and interventions, also realizing risk assessments and identifying mitigation measures. He/she is able to promote innovative projects and intervention increasing the awareness and stimulating the stakeholders’ engagement.

**Analytical Skills**

- Critical thinking skills
- Problem-solving skills
- Identifying “out-of-the-box” solutions
- Interpreting forecasts

The Diagnosis Expert operates continuously acting complex problem-solving skills, and critical thinking. He/she is capable to identify and evaluate the best option within a panel of possible ones. The expert is able to adopt unconventional solutions, thanks to the ability of prefiguring and interpreting forecasts and scenarios.

**Innovation Skills**

- Business case development
- Change management
- Innovation management

The Diagnosis Expert must be able to identify innovation at context (i.e. megatrends), process (i.e. new techniques and systems), and product level (i.e. new materials). Able to read trends, changes and evolutions, he/she is capable to facilitate the integration of innovation at system as well as organizational level, operating with a particular attention to new possible business.
### Financial Skills

- Economic analysis techniques
- Cost control and budgeting
- Financing options, alternative financing

The Diagnosis Expert has financial skills strictly connected to the project planning and management. He/she is able to budget an intervention and is able to identify alternative funding options for supporting projects’ implementation. The expert is able to cooperate with financial officers for administrative and budgeting issues, accordingly.

### Technical Skills

- Data collection and recording
- Data management, tracking, and reporting
- Building Rehabilitation reference framework
- Building construction techniques
- New and emerging technologies
- Energy management fundamentals
- Metering, monitoring, measurement, and verification techniques
- BIM
- Diagnosis process
- Diagnosis systems, techniques and tools
- Inspection process, methodologies and techniques
- Use/combined application of measuring tools/instruments
- Interpretation of data and reporting
- Analysis and evaluation of structural safety of buildings
- Evaluation of resiliency of buildings
The Diagnosis Expert has a wide and solid technical knowledge, result of postgraduate studies and a combination of experiences in different fields, such as Energy efficiency and improvement; Seismic upgrading and improvement; Structural improvement or adaptation; etc. Besides core technical competences and skills, the DE has cross-sectoral abilities as reporting, evaluation capabilities according to applied project management.

Through the comparative analysis of the data collection provided by the partners, it is also worthwhile to consider that the novelty of the profile makes it strongly adaptable to the evolution of the market trends, able to anticipate the sectoral needs in the building and construction supply chain. The Smart Specialization Strategies of the different Member Stated asks for sustainable development as priority for inclusive and smart growth, as well as for fighting climate change. The Diagnosis Expert plays his/her role in complex relational contexts, where sustainability becomes every day a more crucial issue. The expert must be able to promote sustainability, valorise sustainable best practices and projects, cooperating for the implementation of so-called “engagement plans” devoted to suppliers, customers and, relevant stakeholders (public and private). The professional is asked to cooperate in interdisciplinary work teams, being aware of his own competences and expertise, with a proficient interpersonal communication as well public speaking.

In order provide a complete profiling of the Diagnosis Expert, the above –mentioned skills clusterization has to be integrated with the 2 following typologies: 1) Relational skills and 2) Sustainability skills.

| Working in multidisciplinary teams |
| Communication and interpersonal skills |
| Information management principles |
| Facilitation & negotiation |
| Presentation and public reporting |
The complexification of the working contexts (because of digitalization, market globalization, internationalization of the labour market, innovation of the sectoral production processes, through the diffusion and application of new approaches, methodologies and advanced materials, working in multidisciplinary teams), generated changes in the professional profiles, from the point of view of the capability set. Traditionally, in the past, the technical competence (skills, knowledge) was the most important issue, the one with the “more weight” according to an employability approach. Nowadays, the internal balance of the profiles has been changing. Advanced technical skills have to be integrated with a wide panel of transversal skills (managerial, analytical, and relational, as described above). More in general we can say that new technical profiles must possess a consolidated set of Entrepreneurial skills.

Years ago, the European Commission identified sense of initiative and entrepreneurship as one of the 8 key competences necessary for a knowledge-based society. In order to develop a shared definition of entrepreneurship as a competence, with the aim to raise consensus among all stakeholders and to establish a bridge between the worlds of education and work. This common framework called EntreComp- Europenan Competence Framework - https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/entrecomp-entrepreneurship-competence-framework

The graphic representation of the common framework is reproduced in Fig.n.3. This representation could be a strategic input for stakeholders of the Education System, for the design and development of training programmes and curricula meeting the entrepreneurial skills need at any level.
Figure 3 - ENTRECOMP, EU framework for entrepreneurial competences
7. Mapping the key competences of the Diagnosis Expert; inputs for Education stakeholders

This section aims at summarizing the results of the analysis, providing a detailed description of competences and their elements (knowledge, capabilities, and performance indicators) that provide inputs for the design and the development of training programmes and joint-curricula for the qualification of the Diagnosis Expert. The following are the 4 key macro-competences that could represent the spine for the design of a new qualification and the development of updated training opportunities able to anticipate the sectors evolution.

The identified macro competences are:

1) To manage the implementation of a diagnosis process into the legal framework
2) To organize and execute the inspection process
3) Manage technical and structural analysis
4) To manage final conclusions and recommendations (for final diagnosis)

In details:

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<td>▪ To interpret the normative frame of reference in the field of Building Rehabilitation (European, national, regional and local).</td>
<td>▪ To use the legal and regulatory framework applicable in each case, in a precise and adjusted to the environment, in any process of diagnosis.</td>
<td>▪ To interpret, evaluate and argue the diagnosis profile based on the legal and regulatory framework applicable at all times.</td>
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<tr>
<td>▪ To recognize and adapt the legislation and regulations applicable to existing buildings according to historical and technological conditions.</td>
<td>▪ To analyse and correctly apply the legal regulations and resort to the related bibliography.</td>
<td>▪ To recognize the limits of his/her own competence and to refer to appropriate experienced experts, when needed.</td>
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<td>▪ To define the technical regulations applicable to current and historical construction materials and systems.</td>
<td>▪ To correlating different techniques of obtaining data.</td>
<td>▪ To communicate with diverse interlocutors getting and transmitting information in a tight and precise way.</td>
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<td>▪ To interpret the regulations on environmental protection and apply it to building diagnosis processes.</td>
<td>▪ To interpret the results obtained.</td>
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### 2. To organize and execute the inspection process

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| To prospect with precise methodologies the structural elements of the buildings.  
To identify and discuss methodologies for conducting surveys and/or interviews with users, maintenance managers, managers of built parks, etc. (intended for taking data on use, observed dysfunctions, the age of the injuries, etc.)  
To identify and discuss building inspection methodologies, prospecting techniques, sampling criteria and representativeness.  
To recognize, discuss and interpret symptoms and injuries.  
To recognize, discuss and interpret non-destructive testing (NDT) and "in situ" testing as inspection support tools.  
To recognize, discuss and request the necessary aid from specialized companies (construction companies, accessibility, etc.) and laboratories (geotechnics, materials, acoustics, fire, biological, etc.), as well as training for the interpretation of the results obtained.  
To interpret the results obtained in the inspection. Generalization of results. | To identify, choose and apply different techniques and tools for the characterization of materials.  
To identify, choose and apply different techniques and tools for the geometric verification of constructive elements.  
To choose and correctly use different measuring instruments to assess various parameters.  
To choose and organize auxiliary equipment and tools for inspection. Tasting campaigns, sampling, testing "in situ", etc.  
To use combined systems of diverse tests (END, etc.).  
To correlating different techniques of obtaining data.  
To communicate with diverse interlocutors getting and transmitting information in a tight and precise way. | To direct, organize and execute the inspection process.  
To understand and conclude the results of the inspection. |

**EXPECTED OUTPUT/RESULTS**

*To produce diagnosis by application of a precise methodology.*
3. To manage technical and structural analysis

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<tr>
<td>To master the concepts of structural safety, limit states, safety factors, etc.</td>
<td>To choose and organize equipment and auxiliary tools for conducting &quot;in situ&quot; tests, non-destructive structural tests.</td>
<td>To interpret, evaluate and justify the injuries related to the structural systems of buildings.</td>
</tr>
<tr>
<td>To understand the structural behaviour of the building (isoestability, hyperstability), and express in outline the state of qualitative loads, with the help of sketches and other infographics.</td>
<td>To choose and use elementary calculation software with solvency.</td>
<td>To direct, organize and execute processes for the assessment of the structural safety of buildings based on their own knowledge or with the collaboration of experts in structural calculation.</td>
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<tr>
<td>To identify and evaluate qualitatively dysfunctions associated with terrain-foundations behaviour.</td>
<td></td>
<td>To draft general recommendations for intervention and emergency measures.</td>
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<tr>
<td>To identify and evaluate qualitatively the dysfunctions associated with the behaviour of the horizontal structure (beams and slabs)</td>
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<tr>
<td>To identify and evaluate qualitatively the dysfunctions associated with the behaviour of arches, vaults and domes.</td>
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**EXPECTED OUTPUT /RESULTS**

Interpreting damages and dysfunctions together with a qualitative and quantitative assessment of structural safety.
4. To manage final conclusions and recommendations

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<td>To understand the need to adopt an ethical behaviour and a position of impartiality in the exposed opinions, before a conflict of interests. Ability to add and discuss all the information collected during the diagnosis process and to draw clear and precise conclusions. Ability to write the resulting documents adjusted to the language of the profile of the recipient of the document (technician or user). To differentiate the various types of documents that may result from a diagnosis process, depending on your objectives. They can be reports, opinions, certificates, ITEs, certificates of habitability or energy, etc., or complete diagnosis prior to the drafting of a rehabilitation project. To identify risk situations and design emergency measures to alleviate it.</td>
<td>To write, illustrate and present orally, a general and detailed view of the evaluation carried out during the diagnosis, with a precise language, both in the description of the constructive elements and in the assessment of their status. To use graphic expression tools, image processing and infographic representation.</td>
<td>To record all the process carried out, all the methodologies and data obtained, and the reflections made throughout the diagnosis. To synthesize and evaluate the information collected during the diagnosis process and draw clear and precise conclusions regarding the initial objective of evaluating a pathological process or a complete building. Generate the diagnosis. To draft general recommendations for intervention and emergency measures.</td>
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**EXPECTED OUTPUT/RESULTS**

To establish conclusions together with the final diagnosis.
A description of prior competences acted by the Diagnosis expert during his/her work, could be visualized connecting each strategic area of governance to 3 main phases: development, execution, enablement:

Figure 4  The Diagnosis Expert key competences related to prior work phases: development, execution, and enablement.
8. Creating a new professional qualification

The DIAGNOSIS project’s activities and results have confirmed that the rapid evolution of the building and construction sector generated by the digitalization, by the behaviour of existing building heritage, by the progressive diffusion of the so-called “Smart industry paradigm” and, last, but not least, by the increasing need of a stronger resilience of buildings, ask for high-skilled professionals. More in details, in consideration of the fact that the intervention in existing buildings, whether for rehabilitation or maintenance, is a strategic activity all over Europe, representing up to the 50% on average of the investments in the sector, DIAGNOSIS has shown the emerging need of specialized professionals able to manage the building diagnosis processes. In fact, building diagnosis, in view of the complexity of the existing heritage and its state of conservation, is a very articulated and complex process, that, to be realized in a proper way needs ad hoc competences. Despite of ties emerging necessity, the Education systems still seem to be oriented mainly towards the new construction, destining to the existing construction a small part of the available training offers, both at post-secondary and tertiary level (academic, non-academic).

Regional/national public stakeholders and policy makers should take into account the opportunity of innovating the available specializing learning and training programmes, mainly at post-secondary and tertiary level. First of all, it’s worthwhile they consider the necessity of updating, integrating and/or revising their National/Regional Qualification Framework, containing the prior qualifications and professional figures requested by the labour market and territorial sectoral operators.

Of course, the creation of a new professional qualification is an articulated process, involving not only the regional/national public authorities but also a variety of other actors (training centres, trade unions, industrial associations, university, schools…). This imply a validation process at various levels and sometimes it can require long time. Start up and implementation of such processes follow the peculiar political and administrative organization of the Member States of the European Commission.

Despite of differences and peculiarities of the different countries, some common steps could be followed for evaluating the opportunity of introducing a new professional, with specific reference, in this document, to a new qualification called DIAGNOSIS EXPERT. These main steps could be the one mentioned below:

FIRST STEP - ANALYSIS

- The realization of desk resources concerning sources, literature, projects, concerning the building diagnosis;
- The realization of data collection concerning coherent best practices (at educational level, sectoral/territorial level, etc.);
- The realization of focus groups with relevant stakeholders.

All the above –mentioned activities could be finalized o the need analysis in order to describe the emerging role.

SECOND STEP- PROFILING

The description of the role and its characteristics could be realized using formal documents (templates, schedules, etc.), in coherence with the formal procedures followed by the different responsible authority. This step could be managed directly by the manging authority or
recognized promoter (i.e. Education providers). For a first validation of the role description, some expert workshops and multi-stakeholder consultation could be realized for a progressive tuning of the proposal (i.e. resonance groups, multistakeholder online debate, etc.).

THIRD STEP- IN-DEPTH ANALYSIS

Public administrators through their technicians and sectoral experts analyse the documents concerning the new role, designing and describing key competences, skills and knowledge, applying descriptors and indicators of performance in line with the reference framework in use. During this phase the public authority and its experts, could define the qualification level, in order to correlate the under development qualification with the European Qualification Framework (EQF) in order to support the creation of a European Education System and of a European Labour Market.

FOURTH STEP PARTECIPATIVE VALIDATION

The result of the technical works of the previous step could be presented within a set of multistakeholder tables at Regional/national level in order to validate the new qualification (or its updating). After this consultation process, the qualification is ready to be published in the official Repertory.

FIFTH STEP- UPDATING OF THE OFFICIAL STANDARD REFERENCES WITH THE NEW QUALIFICATION

After validation and publication on the Regional /National Qualification Repertory all recognized and accreditated Educational providers could adopt the standard for designing, developing and implementing new training programmes.

The described process will be suitable of a deep customization, according to the different governance at country level, but, anyway, some common steps could be indicate as proposed.

Due to the rapid evolution of the economies and related labour market at international, as well as national and regional level, policy makers have been starting revision process of National/regional Qualification Frameworks; thanks to dissemination of the DIAGNOSIS project outcomes and outputs, what partners have realized could be capitalized as a valuable input for these revision processes themselves.
9. Conclusions

Through this document the Diagnosis partnership highlights the strongholds of the debate realized during the project life, derived from the innovativeness around the emerging common needs of a new profile specialized in management and execution of building diagnosis intervention.

The emerging needs have been generating by the disruptive evolution induced by global phenomena as digitalization, climate change and natural disaster (i.e earthquakes, soil erosion’s process, increasing need of restoration and maintenance of the existing building heritage, etc.), As the introduction and the progressive diffusion of the BIM – Building Information Modelling- caused the birth of new professionals, such as BIM Manager, BIM Specialist, also the need of more specialized competence for the governance of the diagnostic processes, has been asking for a progressive recognition of Diagnosis professionals.

This deep evolution has been ongoing, even if the building and construction sector absorb innovations more slowly than other sectors, because of a sort of “ingrained resiliency”. The diagnostic process is very complex and multifaceted, asking for both technical and transversal high-level skills, but the reflection regarding the importance of the availability of such experts on the labour market is still lacking or, it is at the very beginning, anyway.

It is possible to confirm this state of the art, although there are differences among the different countries, in relation for example to formalization of the professional profiles in the diagnostic field, availability of professional qualification frameworks as reference for formal and non-formal education, credits recognition process between educational systems/levels and programmes, up to certification of competences deriving from non-formal education experiences.

In relation to the DIAGNOSIS project results and outcomes for profiling the Diagnosis expert, it is possible to say that he/ she has a wide panel of technical and non-technical (managerial, analytical, transversal) skills, because the expert has to manage and / or cooperate with the whole diagnosis process (pre-diagnosis, diagnosis, final recommendations) and connected activities (work in team, management of the relational system, customers, stakeholders, citizens, resources planning before intervention, etc), according to a value chain approach.

The following Margarita graph (Fig. 5) describes the combination of knowledge, skills and competences that the Diagnosis Expert should have.

Presumably the debate around the Diagnosis Expert as a crucial profile will increase in the close future, bringing the “spotlights” to needs and strategies for innovating the learning and training offer at secondary, post-secondary, tertiary level, in order to make available new professionals requested by sectoral economic operators.
Figure 5 The diagnosis Expert - combination of knowledge and capabilities
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- Approved Document Part F - Ventilation, NBS
- Approved Document Part G - Sanitation, hot water safety and water efficiency, NBS
- Approved Document Part H - Drainage and Waste Disposal, NBS
- Approved Document Part J - Combustion appliances and fuel storage systems, NBS
- Approved Document Part K - Protection from falling, collision and impact, NBS
- Approved Document Part L - Conservation of fuel and power, NBS
- Approved Document Part M - Access to and use of buildings, NBS
- Approved Document Part P - Electrical Safety, NBS
- Approved Document Part Q - Security, NBS
- Approved Document Part R - Physical infrastructure for high speed electronic communications networks, NBS
- Approved Document Regulation 7 - Materials and workmanship, NBS
National/regional qualifications framework (NQF)

Spain
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- The MECU website: www.mecd.gob.es/mecu
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**List of figures**
- Figure 1, Diagnosis project- Outputs' hyper structure, focus on Intellectual output 2 - Innovating a crucial profession in building and construction sector: THE DIAGNOSIS EXPERT
- Figure 2, Diagnosis Expert: mapping the skills
- Figure 3, ENTRECOMP, EU framework for entrepreneurial competences
- Figure 4, The Diagnosis Expert key competences related to prior work phases: development, execution, and enablement.
- Figure 5, The diagnosis Expert - combination of knowledge and capabilities

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2 Ibid.
3 Ibid., p. 275