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Article

Measurement and Sustainability of the Qualifications Frameworks in the European Higher Education Area through an Employment Survey on Access to the Labour Market

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Abstract: There is a clear need to measure the correct implementation of the European Framework through the employability of the alumni. The evaluation of the deployment of the Qualifications Frameworks in the European Higher Education Area (QF-EHEA/QF) should shed significant light on the action that must be taken by legislators and higher education managers to foster employability and guarantee the sustainability of the EHEA. We propose a methodology based on a Survey on Access to the Labour Market (SALM) to assess the correlation between the education provided to the students and the practical utility of the knowledge acquired in the workplace. A questionnaire has been produced to measure the competencies and descriptors that had been theoretically defined within the QF-EHEA. Fifteen questions were disguised so that the six QF-EHEA descriptors were quantified through the difference between education and utility. The quantification methodology for the framework has been tested successfully on the former students of a higher education center in Spain. In this center, the alumni perceived that the utility of their

acquired competencies and their employability level was greater than their education content, while both levels were reasonably high. The results hold for both Bachelor's and Master's degrees.

Keywords: competencies and descriptors; graduate in higher education; undergraduate; graduate satisfaction; higher education; qualifications; industry requirements

1. Introduction

A notable starting point for achieving sustainable higher education models was the proposal by the European Ministers of Higher Education in the Sorbonne Declaration of 1998, which aimed to harmonize the European system of higher education, conceiving a "Europe of knowledge" [1]. One year later, the Bologna Declaration (1999) [2] started a process leading to the creation of the European Higher Education Area (EHEA) that was designed to "introduce a system of academic degrees that are easily recognizable and comparable, promote the mobility of students, teachers and researchers, ensure high quality teaching and incorporate the European dimension into higher education".

Governments have later identified the need to link and align the European QF-EHEA and EQF (European Qualifications Framework) qualifications frameworks [3–7] and the competencies and employability of their graduates in order to maintain the sustainability of the system. These reference frameworks should be expressed in a language accessible to graduates and other interest groups not directly involved in the development of competencies, thus facilitating a framework to compare employability and the corresponding sustainability of different degrees. There is, therefore, a drive to efficiently measure the employability of QF-EHEA graduates through their competencies at different levels of education (Figure 1).

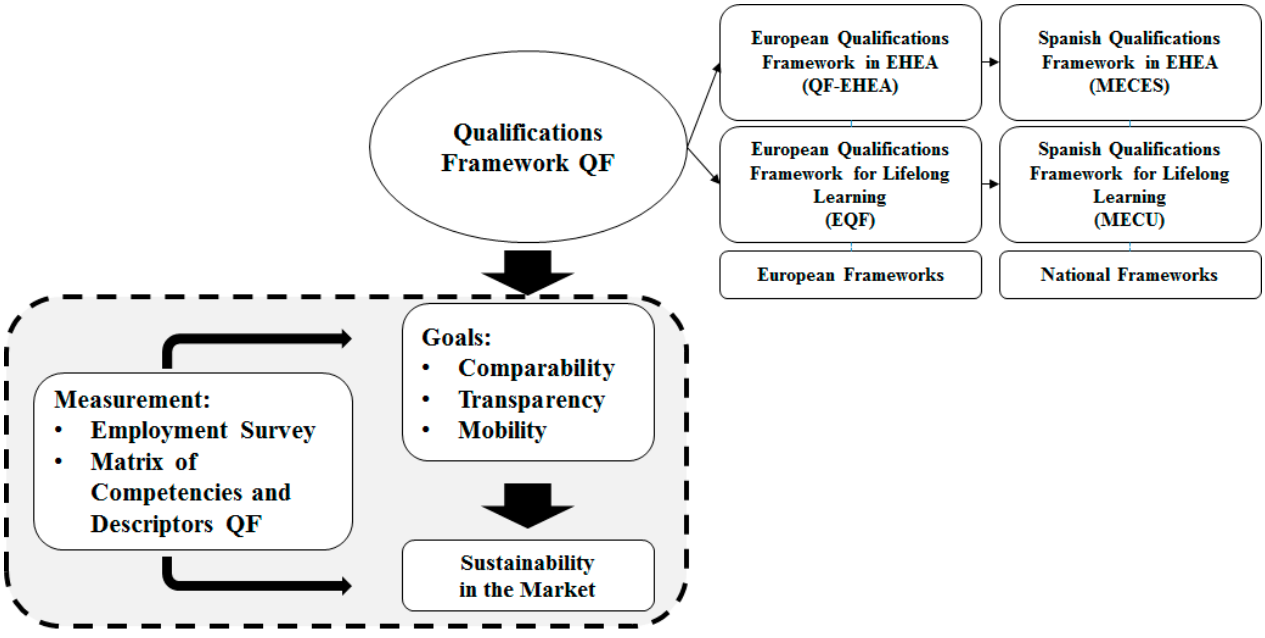

Figure 1. European, national, and sectoral frameworks.

Figure 1 also includes deployment in Spain through the corresponding MECES and MECU programs. Spain is used as a test case to demonstrate the correspondence that must exist between the European and national frameworks in order for the EHEA to survive. Spain was one of the countries involved from the initial stages and the projects developed by the Joint Quality Initiative (JQI) and the Dublin Descriptors (2004) and subsequently the Framework for Qualifications of the EHEA (2005). As a result, early models for the Spanish Qualifications Framework (MECES) included references to the Dublin Descriptors and suggestions for alignment between a national framework and the European one [8].This is the reason it was chosen to validate the methodology proposed in this article.

The creation of these reference frameworks has been highly relevant for all the parties involved. Among the stakeholders who have been the subjects of research in the literature—mainly through interviews and surveys, as they are key beneficiaries of the implementation of the framework and its continuity, we should mention the following:

- "Students", who gain information about possible careers upon completing their studies, as well as the most useful and relevant competencies for the labor market. These link directly with their education so that their educational development may be focused on those particular competencies [9–13];
- "Graduates", who are able to compare their individual professional situation with that of the educational sector to which they belong and detect educational needs in terms of competencies that are being demanded by employers in their area in order to promote improvements in their professional career through continuous education [14–17];
- "Teachers/lecturers", who are willing to adjust their teaching materials to the proper combination of theoretical and applied knowledge [9,12,18–20];
- "Employers", who state their needs in the form of competencies [9,21–25];
- "Higher Education Institutions (HEI)", which have the need for a qualitative measurement tool for the impact of the competencies established, and the detection of deficiencies in education in other competencies areas [26–28], to steer changes in study plans; and also
- "Governments", which need a tool for qualitative measurement to be able to reach ministerial agreements over the EHEA, and therefore obtain information to modify and adapt this legislation to the changes required by the labor market [14,29–37].

Although the descriptors set down for the European qualification frameworks are necessary to enhance mobility and transparency, as well as to facilitate the equivalence of training programs between countries, this does not mean that those descriptors should be exempt from measurement and re-evaluation to adapt them dynamically to the requirements of the labor market. The Bologna process is being implemented to varying degrees in each member state depending on their socioeconomic and political situation. This has made it even more relevant to review and promote European higher education policies as a means to achieve a sustainable higher education system in Europe. Thus, accepting the need for the descriptors declared in EQF and QF-EHEA, it is also necessary to measure and re-evaluate those descriptors in order to adapt them dynamically to the requirements of the labor market. As established by the design of the degrees themselves in the new European framework, these qualifications should prepare students with a specific set of competencies at each level of qualification.

Therefore, it will be essential to ascertain the extent to which the descriptors established by those European qualifications frameworks and their national equivalents address the real needs of the labor

market. In summary, it is necessary to conduct a periodic assessment of the degrees within the European and national qualification frameworks through an assessment of their graduates, so that the study plans can be constantly calibrated and adapted. This approach breaks away from traditional schemes of a few decades ago, whereby study plans did not undergo changes and equivalencies were maintained year after year. This new European common qualifications framework should allow mobility whilst, at the same time, providing a dynamic and flexible framework that responds to the changes required by the labor markets [7]. This idea gives rise to two basic research questions:

RQ1: Are qualifications frameworks measurable?

RQ2: Are the European QF-EHEA and EQF qualifications frameworks sustainable after assuming an affirmative answer to RQ1?

The main purpose of this study is therefore to provide an answer to both questions by quantifying and analyzing the effectiveness and sustainability of the qualifications for undergraduate degrees (Bachelor's degree) and postgraduate qualifications (Master's degree) for QF-EHEA.

The quantitative tool that we propose is a Survey on Access to the Labor Market (SALM) that assesses the sustainability of the qualifications frameworks and their descriptors and competencies by measuring the relationship between the level of education received (LE), and the perceived level of utility and repercussions on employment (LU) as put forward by Deaconu *et al.* in 2014 [38] (Figure 2).

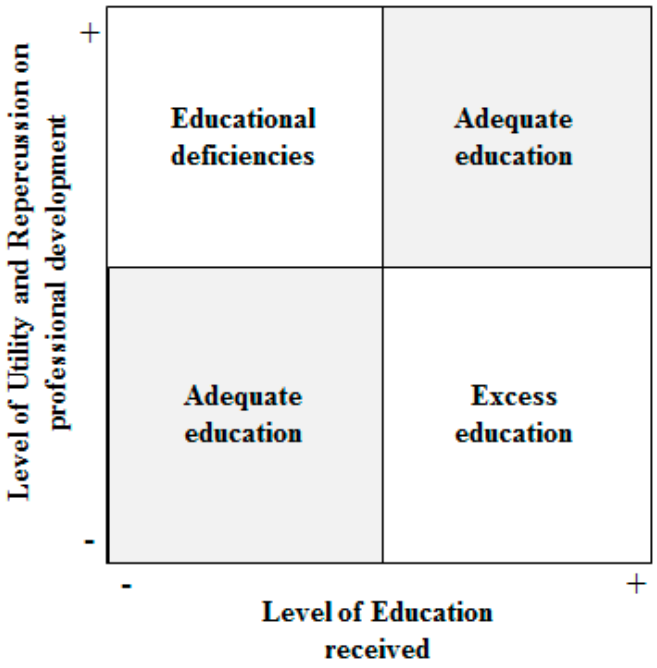

Figure 2. Level of education received *vs.* level of utility and repercussion on employment.

The results of any SALM may then establish the following casuistry, composed of three groups of relationships:

- Group of competencies/descriptors with higher LE *versus* lower LU;
- Group of competencies/descriptors with equivalent LE and LU; and
- Group of competencies/descriptors with lower LE *versus* higher LU.

Based on these sets of relationships, we can identify groups of specific competencies in order to improve a study plan which would stem from an empirical analysis. This would use the competencies collected to measure EQF, which were evaluated by HEI graduates:

- Group of competencies to be included or given greater emphasis in a study plan due to their significant utility and repercussion on professional development, even though these are poorly valued in relation to the education received;
- Group of competencies to be given less emphasis in a study plan due to their limited utility and repercussion on professional development, even though they are highly valued in relation to the education received; and
- Group of competencies to maintain in a study plan due to the equilibrium between the evaluation of their utility; their repercussion on professional development; and their evaluation in relation to the education received—high, medium, and low.

This grouping of competencies will facilitate the identification of action to improve study plans, separating competencies requiring less development from those in need of further advancement. All actions are directed at the sustainability of the education system.

The rest of the article is organized as follows. Section 2 includes the description of the European framework and its need to quantitatively measure the degree of employability through competencies. Section 3 follows with the development of the survey on access to the labor market which is going to be used to measure the competencies, and the descriptors of the educational framework. Section 4 is devoted to summarizing the application of the proposed methodology to graduates of Bachelor's and Master's degrees from a Spanish center of private higher education specializing in the Social Sciences. Section 5 concludes the results of the study.

2. The Higher Education System in Europe

2.1. The European Qualification Frameworks (QF-EHEA and EQF)

In November 2002 the European Commission established a Technical Working Group (TWG) [39] for the development of the principles of the transfer credit system. In the year 2004, to support the "Copenhagen" TWG, the European Commission's agency CEDEFOP (Centre Européen de Développement de Formation Professionnelle) [40,41] developed three research proposals related to the qualification reference levels (the vertical dimension); a typology of knowledge, skills and competences (horizontal dimension), and a system for credit transfer [6,42].

It was not until the year 2005 [43], with the Bergen Communiqué that the European Ministers of Higher Education decided the following:

- to adopt the General Qualifications Framework of the European Higher Education Area (QF-EHEA), as well as a commitment to implement standards and guidelines to ensure quality, as proposed by the ENQA report (European Association for Quality Assurance in Higher Education) before 2007—the year of the London Communiqué [29] focused on "employability";
- to issue and recognize joint qualifications, including PhDs;

- to create flexible higher education course content—including the existence of provisions to validate knowledge acquired; and
- to introduce national qualifications frameworks before 2010 at the latest. One year later, in 2008, the European Council and Parliament also adopted the European Framework of Qualifications for lifelong learning (EFQ), a framework based on an equivalence with the European QF-EHEA framework but which went further by including qualification levels in continuous learning.

After the Bologna Treaty, the HEIs of the EU Member States found in the QF-EHEA and EQF reference frameworks a starting point to coordinate the mobility of students, lecturers and graduates, establishing the different levels that students could reach, from vocational training and secondary school programs up to PhD levels, and even continuous training parallel to building a professional career (Table 1).

Table 1. Alignment of QF-EHEA and EQF and MECES/MECU levels [8].

QF–EHEA Europe	MECES Spain	EQF Europe	MECU Spain
3rd cycle	4—Doctorate	8	8
2nd cycle	3—Master's degree	7	7
1st cycle	2—Bachelor's degree	6	6
Short cycle within the 1st cycle		5	5
		4	4
		3	3
		2	2
		1	1

2.2. The Spanish Qualifications Frameworks (MECES and MECU)

Spain has implemented all of its Bologna commitments, introducing the levels of QF-EHEA and EFQ. The last of these was created under the title of "MECU", whilst the QF-EHEA framework was implemented as "MECES" through Royal Decree 1393/2007 of 6 July, Royal Decree 861/2010, Royal Decree 1027/2011 of 15 July, Royal Decree 96/2014 of 14 February, and Royal Decree 127/2014.

Likewise, criterion 3 of the VERIFICA [44] program, which regulates the approval of degree qualifications under the new EHEA in Spain, incorporates the need to identify the competencies which students must acquire when obtaining a degree. These should cover the competencies described in MECES for each level—Bachelor, Master and Doctorate. The report on MECES self-certification, drafted by the Spanish National Agency for Quality Assessment and Accreditation (ANECA) [8] details, at the request of the European Commission, the Regulations which implemented the objectives of the new EHEA. The need to align the European qualifications frameworks has led to recent legislative changes through Royal Decree 43/2015 [45], which offered a flexible higher education framework, going from the rigid 4 + 1 (years) system implemented initially adopting EHEA, to a 3 + 2 or 4 + 1 system, as had been initially implemented in the majority of EHEA countries, with certain exceptions such as Cyprus, Turkey, Armenia, Georgia, Greece, Kazakhstan, Russia, and Ukraine.

The establishment of three-year courses—MECES level 2, QF-EHEA 1st degree, EQF level 6 and MECU level 6—aligned with European Bachelor's degrees, promoted a more general education in competencies, enabling further specialization through Master's programs. This option of Bachelor's

and Master's programs provides students with multiple combinations to shape their own education, starting from preferred studies and, therefore, preferred employment. They will thus learn the competencies expected of them in the labor market, and which they will acquire through the degrees offered by the university system.

For both the Spanish Ministry of Education and Culture and the other ministries in the Member States it is a key objective to implement the directives set out in the qualifications frameworks through their government departments. This would include, firstly, approval, monitoring and evaluation of degree qualifications, and secondly, through the HEI, the design, implementation, review, and improvement of study plans.

2.3. The Framework Descriptors

The implementation of the European and Spanish frameworks is based on so-called descriptors [7], which provide qualitative directions for setting down the required competencies.

For the Bachelor's degree program (QF-EHEA, undergraduate degree/MECES Level 2), the list of the five descriptors (with their corresponding acronyms: DB for "descriptors for Bachelor's degrees") is as follows:

- **1st Descriptor (DB_01):** have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study.
- **2nd Descriptor (DB_02):** can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competencies typically demonstrated through devising and sustaining arguments and solving problems within their field of study.
- **3rd Descriptor (DB_03):** have the ability to formulate judgments to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical issues.
- **4th Descriptor (DB_04):** can communicate to both specialist and non-specialist audiences information, ideas, problems, and solutions.
- **5th Descriptor (DB_05):** learning competencies have developed those learning competencies that are necessary for them to continue to undertake further study with a high degree of autonomy.

Regarding the Master's programs (QF-EHEA, postgraduate courses/MECES Level 3), the corresponding five descriptors are (DM "for descriptors for master's degree"):

- **1st Descriptor (DM_01):** knowledge and understanding in a field of study that is founded upon and extends and/or enhances that typically associated with the first cycle, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context.
- **2nd Descriptor (DM_02):** can apply their knowledge and understanding and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.

- **3rd Descriptor (DM_03):** have the ability to formulate judgments to integrate knowledge and handle complexity, and formulate judgments with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.
- **4th Descriptor (DM_04):** can communicate to both specialist and non-specialist audiences their conclusions, and the knowledge and rationale underpinning these, clearly and unambiguously.
- **5th Descriptor (DM_05):** have the learning competencies to allow them to continue to study in a manner that may be largely self-directed or autonomous.

Other competencies associated to the general qualifications in the Spanish Qualifications Framework are also identified, and added as a basis for the qualifications described previously in the European (QF-EHEA and EQF) Qualifications Frameworks, termed General Competencies, which any MECES level should reach—whether Bachelor's or Master's degree—and which are comprised of three descriptors (MECES GENERAL (**DMG_00**):

- **1st Descriptor:** respect for the fundamental rights of equality between men and women, with relevant study plans including courses related to said rights.
- **2nd Descriptor:** respect for and promotion of Human Rights and the principles of universal access and design for all, in accordance with the tenth final disposition of Law 51/2003, from December 2nd, on Equal Opportunities, eliminating discrimination and facilitating universal access for disabled individuals, with relevant study plans including courses related to said rights and principles.
- **3rd Descriptor:** in accordance to the inherent values of a culture of peace and democratic values, with relevant study plans including courses related to said values.

2.4. The Need for Continuous Review

Numerous national and international studies have been conducted along these lines, with a view to evaluating the performance of the QF-EHEA and EQF qualifications frameworks in relation to their proximity to or distance from labor market requirements for EHEA graduates.

At the international level, it is worth noting the actions of the European Commission through "Project 2000" [14] and the review proposal in 2012 by the EHEA Conference of Education Ministers for the European Standards and Guidelines (ESG), to guarantee quality in the European Higher Education Area, published in 2005. This would have to incorporate the improvements provided by the E4 Group (ENQA, ESU—European Students' Union, EUA—European University Association, EURASHE—European Association of Institutions in Higher Education) in cooperation with EI—Education International, BUSINESSEUROPE, and EQAR (European Quality Assurance Register for Higher Education) in terms of optimizing clarity, applicability, utility, and scope. It was agreed that the review would aim to improve employability, continuous, cross-sectional, and innovative learning, business competencies, and stimulate student learning through policies and recommendations for their development.

Among others issues the new ESG published in May 2015 [37] aimed to provide a response to the demand for new methods for acquiring competencies and knowledge in higher education, recognizing the competencies acquired outside regulated study plans, and reinforcing the need for a flexible, global

and dynamic education system that was supported by digital tools and which promoted student participation in the design of the teaching and learning methodologies applied by the HEI, as well as counting on the support of all interest groups.

Likewise, it was made clear that in order to assure quality and increase transparency European higher education systems must build an environment of mutual trust in which there is better recognition of qualifications, programs and other provisions. Point 1.2 "Design and approval of programs" in one of the reviews of European Standards and Guidelines (ESG) to guarantee quality in the European Higher Education Area, explains that qualifications obtained by students should match the national qualifications framework and, consequently, the European QF-EHEA. In point 1.1 "Quality Policy and Guarantee", this review also incorporates into the internal process of the HEI the need to monitor "Postgraduate courses".

This inclusion within the ESG responds to the need to provide continuous information systems in the HEI, where one of the variables to be analyzed continuously is the professional development of graduates, as a source of feedback in the design or redesign process of the education centers. In addition, this source of information is further reinforced by point 1.9: "Implementation of periodic monitoring and review of programs" which established the need to continuously monitor the demands of students and society, so that institutions can develop plans of action that respond to these demands. In an analytical study in 2014, Garrouste [46] considered the need for future studies which delved deeper into the specific competencies of the European Qualifications Framework which were demanded by the labor market in each country, in such a way that study plans would be made continuously flexible and able to adapt to changes in the current dynamic and global market. In summary, as put forward by Brenda Little in 2008 [47], it is important to determine the extent to which harmonization of higher education programs—derived from the Bologna process—affects the relationship between higher education and employment, *versus* the previous scenario, where considerable differences existed between member states' programs and, therefore, the employability of graduates from different countries.

3. SALM: Surveys on Access to the Labor Market

Today's rapidly and permanently changing labor market makes it essential to constantly match the competencies of professionals with the real needs of the market. When referring to "competencies", Rowe highlighted in 1995 [48] the need for a clear terminology that distinguished between "competence" and "competency". The former corresponds to the concept of competencies referred to in this study; it is based on models like the MCI regulations (Management Charter Initiative) in the field of skill assessment, and focuses on what individuals are capable of, establishing a need for clear and measurable standardized competencies, and leaving aside categorization by qualifications. These changing competencies will require dynamic models for the processes of design, implementation, and revision of study plans through the quantification of the descriptors of the European frameworks.

Our key innovation is the development of a Survey on Access to the Labor Market (SALM) that quantitatively relates employability and European Framework descriptors, not simply competencies, through differences between levels of education and utility, as perceived by alumni already in the labor market, with at least three years of work experience.

Let us discuss first how employability and competencies are currently being measured and then develop the quantitative SALM to assess the level at which the QF descriptors are deployed into the labor market.

3.1. Quantification of Employability

One of the main concerns raised during the transition to the new European Higher Education Area was to quantify how many graduates attained employment related to their studies and, conversely, how many were in positions which did not correspond to the level of their studies. The difficulty in measuring the data to analyze possible mismatches between employment and studies led to considerable research into European countries. Most studies focused on identifying levels of education *versus* utility and their repercussion on employment.

In this context, a highly valuable source of data for these studies was the CHEERS project (Careers after Higher Education: a European Research Study). This project, supported by the EU's TSR [15] program, was launched in 1997 by a group of European and Japanese researchers, and its objective was to analyze the employment and jobs of graduates from higher education institutions in nine European countries—in addition to Japan—during the first years after graduation. The CHEERS Project developed a questionnaire for these graduates and collected responses from 3000 individuals, providing information on the relationship between higher education and employment four years after graduation. The questionnaire listed competency groups—36 different items relating to the competencies provided and required—which had to be evaluated from the perspective of education, as well as their utility and repercussion on employment, among other study variables. Four years later, the program had collected a database with information from over 40,000 surveys.

The repercussions of the CHEERS Project led not only to numerous publications and articles about the Project itself but also to a trend in analyzing "Access to the labor market" from that moment onwards in all EHEA member states. In this regard it is worth noting that comparability in the EHEA is only possible by gathering information from all European studies about the processes of graduate employability. Many of these studies agree in highlighting the inherent difficulty in comparing between countries, due to diverging policies in many cases, as well as differences between the statistical methodologies applied [14] and the indicators used for measuring and interpreting the study variables. Nevertheless, they also agree in highlighting the importance of these studies on graduates, in terms of relevant indicators in the analysis of the relationship between "higher education and employment".

Researchers who, since then, have studied competencies and employability in Europe—and also outside—have also provided some needs and elements to reflect upon, which could be grouped into different categories including socioeconomic aspects, educational–employment policies, and characteristics of the relationship between the stakeholders involved—educational institutions, graduates and employers:

(a) Some ascribe more importance to socioeconomic factors than to aspects of competition [49] as the source of the problem of unemployment. Thus, we find some authors who underscore the unforeseeable consequences of a constant increase in the percentage of the population with higher education [50]. Meanwhile, others highlight the importance of structural factors, such as heterogeneity within the labor markets in each country [51]—socioeconomic imbalances between the north and

south[14], or the types of educational programs and fields of study, as well as personal factors; gender and economic standing of a graduate's family [52]; level of parental education, competencies at the time of graduation, employment conditions—economic sector, size of the organization, and the experience after graduation [53]. Other opinions in this regard, which serve to balance the debate, point out that going through university tends to iron out class differences soon after graduation, thus arguing that any initial social differences do not represent a discriminating factor in terms of employability [54].

(b) Another set of aspects highlighted by researchers are related to educational and labour policies. These include a need for greater balance and alignment between educational policies and employment policies, to foster an improvement in employability within countries [31]. In this regard, some have suggested a need to prioritize the Bologna Declaration *versus* the objectives of national higher education policies [34]. Some authors describe certain irregular situations detected, such as salary mismatches stemming from the replacement of non-graduate technical staff with graduates [55]; others even consider analyzing the importance of having a degree or not, in terms of employability [56]. Many consider it necessary for higher education to become aware of and adapt to the requirements of the labor market, thus preparing students to play a more proactive role in society [57]. Such proposals suggest increasing the flexibility of higher education programs, in order to facilitate a rapid response in terms of optimizing the quantity and quality of those competencies [58] truly demanded by the labor market, as well as reducing the focus on competencies already offered by an excessive number of graduates [35,59]. In this area some point to the "over-education" phenomenon which is mainly seen in Spain [60]. Another point highlighted is the need to focus on curricular design of aspects such as: emphasis on general knowledge and flexibility; problem-solving capacity; contrast between theory and practice; multidisciplinarity; international competencies, *etc.* [57] In turn, other studies [46] conclude that labor markets seem to mainly value the capacity of graduates in higher education to combine their studies with employment; that is, a capacity to manage heavy workloads, combined with intellectual flexibility. In this regard, European universities must develop students' competencies and prepare them for sustainable employment by fostering reforms initiated within the framework of the Bologna process [61].

Employment policies should address the need to apply micro- and macroeconomic policies [62], seeking new, unconventional ideas and policies in order to help create the necessary volume of high-quality employment to meet current adverse conditions [63]. Furthermore, it is also important to consider the need to modify and strengthen employment protection regulations to favor worker mobility within Member States and avoid an exodus of graduates who are attracted by better conditions offered in certain countries [36]. Nevertheless, many studies conducted with a more global approach support the belief that HEI may have a legal framework which favors undergraduate and postgraduate/master's training programs which are tailored to the demands of worldwide labour markets. Therefore, it is important to analyze not only the need for local policies enabling HEI to offer flexible programs adapted to the changing needs of labor markets, but also including in those programs the competencies demanded beyond the home continent of each institution. These programs must address a globalized labor market by fostering competencies based on transcontinental requirements.

(c) The studies also highlight a need for a more effective interaction between educational institutions, graduates and employers [64]. This need for the participation of those involved in the

process of the new EHEA was one of the points highlighted by the 2001 Prague Communique [65], although it only refers to universities and graduates. Several authors also involve other agents; for example, teaching staff, who should be trained to manage the new needs of an education system based on the competencies and knowledge demanded by the labor market at any time [66]. On the other hand, some experts point to the decisive role of employers in the initial professional training of graduates and their subsequent continuous development [47], detecting their needs and difficulties—for example, in terms of communication competencies [67]. Others go beyond competencies and highlight the importance of graduates' own experience in a position where employers actively participate in a structured design of their training to favor employability [68]. In relation to the evaluation of all parties involved, one line of research followed by academics from several higher education institutions includes running employability studies through surveys aimed at different groups [69,70] with the aim of favoring a better match between university graduates and real job offers.

All the lines of research analyzed for the present study promote a need to measure and analyze the education received within the EHEA, in view of the requirements of employers in a global labor environment through quantification of the competencies and descriptors in the European frameworks.

3.2. Identification of Competencies

The definition of the descriptor for the European Qualifications Framework is based on the fact that "*They are of necessity quite general in nature*" [7,71] so as to be applicable to a whole range of disciplines existing in the EEAs.

However, after the publication of the Bologna Framework 2005, debates arose regarding the generalist competence implied by the descriptors described in the European Qualifications Framework. Research was conducted to this effect, such as that by Wirtenton in 2009 [32,41,72] where the Competence models and the European Qualifications Framework are analyzed and the debate on the existence of a great diversity of competence models is exposed, not only existing within, but also between EEA countries; so, too, the need for the existence of a sufficiently large common ground for a common European focus to support the European Qualifications Framework.

Despite the debate of posterior research studies on the generalist focal points of competences described for the QF-EHEA descriptors, this research proposes a competence identification analysis in line with the QF descriptors and supports the same generalist aim with which the Descriptors were proposed by the Bologna Framework [7].

The analysis and identification of competencies to measure the different qualifications frameworks were based on several of the studies cited throughout the project, particularly the literature on general competencies.

In this regard, Table 2 includes a thorough comparison of the state of the art in terms of the competencies that have been used in the past. The studies analyzed were the most relevant in the field of competencies and employability of graduates, from the influential CHEERS Project conducted in 2000 up to the present. Table 2 was produced in the following phases:

(1) Identification of the major articles, included in the first row.
(2) Identification of the competencies used in each research project, included in the first column.

(3) Identification of the competencies with the initials of the author/s and numbering from 1 to the total number of competencies examined in each study. The last row identifies the total number of competencies used in each of the articles analyzed.
(4) Assignment of each competency used in each article with one or more of the 36 competencies used in the CHEERS Project, and which served as a basis for all future research work, except for 4 competencies, for which there is direct association with the competencies of the CHEERS Project.
(5) Identification of a number of competencies summarizing the overall set of competencies used by the studies analysed, reducing the 40 competencies to a more manageable figure of 15. We include a comparison between CHEERS and the study by García-Aracil in Appendix as an example.

The selection of the "best 15" is not only because they are the ones that are most repeated but also because they are the ones that are best aligned with the competencies described by the Descriptors in the European QF-EHEA and MECES Qualifications Framework. The result of this phase is shown in the last column of the table, with a total of 15 competencies, coded with the initials of the authors and aligned to one or more of the 40 competencies listed in the first column.

The final list of competencies proposed in this article is as follows:

- C01. Theoretical education.
- C02. Practical education.
- C03. Written expression: knowing how to express ideas clearly when drafting texts, adapting the language style to the target audience, and using specific and relevant vocabulary.
- C04. Oral expression: knowing how to express ideas clearly in conversations or debates, adapting the language style to the intended audience, and using specific and relevant vocabulary.
- C05. Teamwork: ability to reach a compromise within a team, habit of collaborating, and working together to resolve any conflicts that may arise.
- C06. Leadership: capacity to lead working groups and meetings, and to supervise others.
- C07. Decision-making and problem solving: identification of problems, causes, and different alternatives; selection and evaluation of the most appropriate ones.
- C08. Critical thinking: capacity to analyze, summarize, and draw conclusions from an article—be it an opinion or scientific article.
- C09. Everyday reasoning: capacity to find arguments defending the opposite opinion to one's own—theoretical framework, ideology, values, social conflicts, *etc.*
- C10. Creativity: capacity for innovation, initiative, promoting ideas and inventiveness.
- C11. Learning ability.
- C12. Self-management: capacity to manage schedules and resources: develop plans, prioritize activities, identify criticism, set targets, and meet them.
- C13. Documentation: consulting relevant databases in each professional field; specific publications, "expert" Internet browsing.
- C14. Languages: knowledge of foreign languages.
- C15. Information and communication technologies: knowledge of the most common tools and technologies: word processors, spreadsheets, e-mail, web browsing, social networks, *etc.*

Table 2. Competencies analyzed in studies of employability of higher education graduates in research works between 2010–2015.

	Competencies	Teichler, U. [57]	Vidal, J.; López, R.; Pérez, C. [73]	Gallardo Vigil, M.A. [74]	Matlay, H.; Rae, D. [75]	Vaatstra, R.; de Vries, R. [76]	García-Aracil, A.; van der Velden, R. [17]	Andrews, J.; Higson, H. [77]	Jurse, M.; Tominc, P. [18]	De Guzmán, A.B.; de Castro, B.V. [78]	Salisbury, M.H.; Umbach, P.D.; Paulsen, M.B.; Pascarella, E.T. [79]	Ionescu, I.; Guillaume, J.-F.; Pelt, V.; Baumann, M.; Amara, M.-E. [61]	Ruiz Carrascosa, J. [80]	Azevedo, A.; Apfelthaler, G.; Hurst, D. [81]	Bachynsky, E.A.; Dale, V.H.M.; Kinnison, T.; Gazzard, J.;Baillie, S. [67]	Deaconu, A.; Osoian, C.; Zaharie, M.; Achim, S.A. [38]	Cebrián, G.; Junyent, M. [20]	Serrano, G.; Llamazares, F.; Otamendi, F.J.
1	Broad general knowledge	CH.01	VLP.07				GAV.29	JH.01		GC.03			RC.04					
2	Cross-disciplinary thinking/knowledge	CH.02				VV.01	GAV.22			GC.03			RC.04	AAH.06		DOA.21	CJ.06	
3	Field-specific theoretical knowledge	CH.03	VLP.07	GV.01		VV.02	GAV.30			GC.03			RC.04			DOA.09		C.01
4	Field-specific knowledge of methods	CH.04	VLP.07	GV.02		VV.03	GAV.23			GC.01			RC.02			DOA.07		C.02
5	Foreign language proficiency	CH.05	VLP.12	GV.14			GAV.32		JT.10	GC.02			RC.03			DOA.17		C.14
6	Computer skills	CH.06	VLP.12	GV.03	RAE.15		GAV.05	JH.05, JH.08	JT.09	GC.01		IGPBA.06	RC.01			DOA.12		C.15
7	Understanding complex social, organisational and technical systems	CH.07	VLP.12	GV.03	RAE.15, RAE.19		GAV.14	JH.03, JH.04, JH.08	JT.14	GC.01	SUPP.03	IGPBA.06	RC.01	AAH.06	BD.13	DOA.12	CJ.02	C.12

Table 2. *Cont.*

	Competencies	Teichler, U. [57]	Vidal, J.; López, R.; Pérez, C. [73]	Gallardo Vigil, M.A. [74]	Matlay, H.; Rae, D. [75]	Vaatstra, R.; de Vries, R. [76]	García-Aracil, A.; van der Velden, R. [17]	Andrews, J.; Higson, H. [77]	Jurse, M.; Tominc, P. [18]	De Guzmán, A.B.; de Castro, B.V. [78]	Salisbury, M.H.; Umbach, P.D.; Paulsen, M.B.; Pascarella, E.T. [79]	Ionescu, I.; Guillaume, J.-F.; Pelt, V.; Baumann, M.; Amara, M.-E. [61]	Ruiz Carrascosa, J. [80]	Azevedo, A.; Apfelthaler, G.; Hurst, D. [81]	Bachynsky, E.A.; Dale, V.H.M.; Kinnison, T.; Gazzard, J.; Baillie, S. [67]	Deaconu, A.; Osoian, C.; Zaharie, M.; Achim, S.A. [38]	Cebrián, G.; Junyent, M. [20]	Serrano, G.; Llamazares, F.; Otamendi, F.J.
8	Planning, co-ordinating and organising	CH.08	VLP.11	GV.05	RAE.14	VV.04	GAV.02	JH.10	JT.13	GC.01			RC.02	AAH.04		DOA.02		C.12
9	Applying rules and regulations	CH.09			RAE.19			JH.01	JT.08	GC.01			RC.01					
10	Economic reasoning	CH.10			RAE.02, RAE.16		GAV.07			GC.03			RC.04		BD.01, BD.02, BD.03, BD.07, BD.08, BD.10,BD.14			
11	Documenting ideas and information	CH.11	VLP.11	GV.05	RAE.03, RAE.14		GAV.15	JH.10	JT.09, JT.13	GC.01	SUPP.03		RC.02					C.12, C.13
12	Problem-solving ability	CH.12	VLP.05	GV.06	RAE.05	VV.05	GAV.09		JT.05, JT.12	GC.03		IGPBA.03	RC.04			DOA.06		C.07
13	Analytical competencies	CH.13	VLP.07	GV.12	RAE.10, RAE.16	VV.06	GAV.21		JT.14	GC.03			RC.04	AAH.03			CJ.04	
14	Learning abilities	CH.14	VLP.09		RAE.17	VV.07	GAV.31		JT.07	GC.03	SUPP.08		RC.04			DOA.05		C.11
15	Reflective thinking, assessing one's own work	CH.15	VLP.10			VV.08	GAV.17		JT.04	GC.03			RC.04	AAH.04		DOA.01		C.08

Table 2. *Cont.*

	Competencies	Teichler, U. [57]	Vidal, J.; López, R.; Pérez, C. [73]	Gallardo Vigil, M.A. [74]	Matlay, H.; Rae, D. [75]	Vaatstra, R.; de Vries, R. [76]	García-Aracil, A.; van der Velden, R. [17]	Andrews, J.; Higson, H. [77]	Jurse, M.; Tomine, P. [18]	De Guzmán, A.B.; de Castro, B.V. [78]	Salisbury, M.H.; Umbach, P.D.; Paulsen, M.B.; Pascarella, E.T. [79]	Ionescu, I.; Guillaume, J.-F. Pelt, V.; Baumann, M.; Amara, M.-E. [61]	Ruiz Carrascosa, J. [80]	Azevedo, A.; Apfelthaler, G.; Hurst, D. [81]	Bachynsky, E.A.; Dale, V.H.M.; Kinnison, T.; Gazzard, J.; Baillie, S. [67]	Deaconu, A.; Osoian, C.; Zaharie, M.; Achim, S.A. [38]	Cebrián, G.; Junyent, M. [20]	Serrano, G.; Llamazares, F.; Otamendi, F.J.
16	Creativity	CH.16	VLP.08	GV.13	RAE.05			JH.09		GC.03			RC.04				CJ.08	C.10
17	Working under pressure	CH.17	VLP.11	GV.05	RAE.14		GAV.06	JH.10	JT.13	GC.03			RC.04		BD.04	DOA.13	CJ.07	C.12
18	Accuracy, attention to detail	CH.18					GAV.16			GC.01			RC.02					
19	Time management	CH.19	VLP.11	GV.05	RAE.01, RAE.14		GAV.04	JH.10	JT.13	GC.03			RC.04	AAH.04		DOA.03		C.12
20	Negotiating	CH.20			RAE.10		GAV.01	JH.06		GC.02	SUPP.06		RC.03	AAH.01	BD.06, BD.09	DOA.18		
21	Fitness for work	CH.21			RAE.10			JH.01		GC.03			RC.04			DOA.04		
22	Manual skills	CH.22								GC.01			RC.01			DOA.07		
23	Working independently	CH.23	VLP.07	GV.04	RAE.01	VV.09	GAV.18		JT.01	GC.03			RC.04	AAH.04		DOA.04		
24	Working in a team	CH.24	VLP.03	GV.08	RAE.12	VV.10	GAV.13	JH.06	JT.15	GC.02	SUPP.02, SUPP.04, SUPP.06	IGPBA.04	RC.03	AAH.02	BD.11, BD.16	DOA.08		C.05
25	Initiative	CH.25		GV.13	RAE.03		GAV.12	JH.05		GC.03	SUPP.02		RC.04			DOA.11		
26	Adaptability	CH.26			RAE.18		GAV.19		JT.06	GC.02	SUPP.02		RC.03		BD.04	DOA.05, DOA.14	CJ.03	
27	Assertiveness, decisiveness, persistence	CH.27	VLP.11	GV.05	RAE.07, RAE.14		GAV.11	JH.10, JH.02	JT.13	GC.03			RC.04	AAH.01			CJ.07	C.12

Table 2. *Cont.*

	Competencies	Teichler, U. [57]	Vidal, J.; López, R.; Pérez, C. [73]	Gallardo Vigil, M.A. [74]	Matlay, H.; Rae, D. [75]	Vaatstra, R.; de Vries, R. [76]	García-Aracil, A.; van der Velden, R. [17]	Andrews, J.; Higson, H. [77]	Jurse, M.; Tominc, P. [18]	De Guzmán, A.B.; de Castro, B.V. [78]	Salisbury, M.H.; Umbach, P.D.; Paulsen, M.B.; Pascarella. E.T. [79]	Ionescu, I.; Guillaume, J.-F. Pelt, V.; Baumann, M.; Amara, M.-E. [61]	Ruiz Carrascosa, J. [80]	Azevedo, A.; Apfelthaler, G.; Hurst, D. [81]	Bachynsky, E.A.; Dale, V.H.M.; Kinnison, T.; Gazzard, J.;Baillie, S. [67]	Deaconu, A.; Osoian, C.; Zaharie, M.; Achim, S.A. [38]	Cebrián, G.; Junyent, M. [20]	Serrano, G.; Llamazares, F.; Otamendi. F.J.
28	Power of concentration	CH.28					GAV.28			GC.03			RC.04	AAH.04				
29	Getting personally involved	CH.29			RAE.01		GAV.20	JH.01		GC.03	SUPP.02		RC.04				CJ.07	
30	Loyalty, integrity	CH.30	VLP.07				GAV.25			GC.03	SUPP.02, SUPP.04		RC.04				CJ.01	
31	Critical thinking	CH.31	VLP.06	GV.13			GAV.27			GC.03		IGPBA.02	RC.04	AAH.03		DOA.20	CJ.01, CJ.05	C.08
32	Oral communication skills	CH.32	VLP.02	GV.10	RAE.09		GAV.10	JH.07		GC.02			RC.03	AAH.08	BD.05, BD.09, BD.12,BD.15	DOA.10		C.04
33	Written communication skills	CH.33	VLP.01	GV.11	RAE.09		GAV.26	JH.07		GC.03		IGPBA.01	RC.04	AAH.07		DOA.16		C.03
34	Tolerance, appreciating of different points of view	CH.34	VLP.07	GV.09			GAV.24	JH.01, JH.06		GC.02	SUPP.01, SUPP.05		RC.03	AAH.02		DOA.15		
35	Leadership	CH.35	VLP.04	GV.07	RAE.08, RAE.11		GAV.08	JH.05	JT.11	GC.03		IGPBA.05	RC.04	AAH.05		DOA.19	CJ.08	C.06

Table 2. *Cont.*

	Competencies	Teichler, U. [57]	Vidal, J.; López, R.; Pérez, C. [73]	Gallardo Vigil, M.A. [74]	Matlay, H.; Rae, D. [75]	Vaatstra, R.; de Vries, R. [76]	García-Aracil, A.; van der Velden, R. [17]	Andrews, J.; Higson, H. [77]	Jurse, M.; Tominc, P. [18]	De Guzmán, A.B.; de Castro, B.V. [78]	Salisbury, M.H.; Umbach, P.D.; Paulsen, M.B.; Pascarella, E.T. [79]	Ionescu, I.; Guillaume, J.-F. Pelt, V.; Baumann, M.; Amara, M.-F. [61]	Ruiz Carrascosa, J. [80]	Azevedo, A.; Apfelthaler, G.; Hurst, D. [81]	Bachynsky, E.A.; Dale, V.H.M.; Kinnison, T.; Gazzard, J.; Baillie, S. [67]	Deaconu, A.; Osoian, C.; Zaharie, M.; Achim, S.A. [38]	Cebrián, G.; Junyent, M. [20]	Serrano, G.; Llamazares, F.; Otamendi, F.J.
36	Taking responsibilities, decisions	CH.36	VLP.05		RAE.06, RAE.08		GAV.03	JH.05, JH.11		GC.03			RC.04			DOA .07	CJ.03	C.07
37	Participating in social and industry or professional networks.				RAE.13					GC.02			RC.03					
38	Ability to work in an international context								JT.02	GC.02	SUPP.01, SUPP.05		RC.03					
39	Appreciation of diversity and multiculturality								JT.03, JT.16	GC.02	SUPP.01, SUPP.05, SUPP.07		RC.03					C.09
40	Accountability in completing tasks															DOA .01		
	Total competencies	**36**	**12**	**14**	**19**	**10**	**32**	**10**	**15**	**3**	**8**	**6**	**4**	**8**	**16**	**21**	**8**	**15**

3.3. From Competencies to Framework Descriptors

Our first key new feature is the identification of the descriptors associated to the levels of Bachelor's and Master's degree required by QF-EHEA, and their association with student competencies (Figure 3). The descriptors of the QF-EHEA qualifications were translated into the Spanish MECES qualifications framework with no modifications, adding to the latter certain generic descriptors that must be achieved at both levels: Bachelor's and Master's degree, and which will be taken into account in the measurement made by this research. As previously pointed out in the study, the Spanish MECES qualifications framework is equivalent to the qualifications required by the European QF-EHEA qualifications framework.

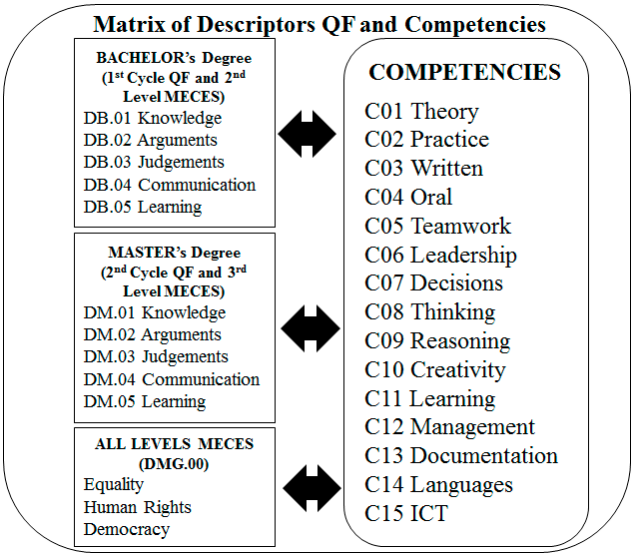

Figure 3. Descriptors and competencies.

Prior to the association of competencies to each of the descriptors, the same nucleus was identified for each of the corresponding descriptors, both at the level of Bachelor's and Master's degree: Nevertheless, despite sharing the same nucleus, its scope determined the specifications, which led us to investigate the association between different competencies for each descriptor of for Bachelor and Master's degree level separately. Furthermore, it is important to point out that the competencies evaluated in this research may not coincide for each descriptor at each course level, given the differences in scope in the descriptors for each level. It is also worth noting the possibility that one single competency may be associated with the measurement of several of the aspects included in a descriptor. However, the descriptors should be considered by any under- or postgraduate, regardless of their field of specialization and the EHEA country where the course takes place.

Table 3 associates the competencies enumerated for the measurement of a qualifications framework for each of the descriptors in the qualification levels of the European QF-EHEA and MECES Qualifications Framework for the level of Bachelor's and Master's degree. The cell values specify the part of each descriptor that should be covered partly or fully by one or more of the 15 competencies. The conversion values should be a number between 0 and 1. In this first version of the methodology we have preferred to initialize the values to either 0 (not covered) or 1 (at least partially covered) but the user of the methodology may choose any value within the 0–1 range without losing validity.

Table 3. List of competencies associated to the descriptors of the European QF-EHEA and MECES Qualifications Framework for the levels of Bachelor's and Master's degree.

D	Descriptors	QF-EHEA 1st Cycle ≈ MECES 2nd (BACHELOR)_DB					QF-EHEA 2nd Cycle ≈ MECES 3rd (MASTER)_DM					MECES GENERAL_DMG00		
		DB01_1st Descriptor	DB02_2nd Descriptor	DB03_3rd Descriptor	DB04_4th Descriptor	DB05_5th Descriptor	DM01_1st Descriptor	DM02_2nd Descriptor	DM03_3rd Descriptor	DM04_4th Descriptor	DM05_5th Descriptor	MEGE01	MEGE02	MEGE03
C		**Competencies**												
C01	Theoretical education	1					1							
C02	Practical education		1				1							
C03	Written expression	1		1				1						
C04	Oral expression		1		1		1		1					
C05	Team work							1				1	1	1
C06	Leadership		1		1		1		1		1			
C07	Decision making and problem solving			1				1			1	1	1	1
C08	Critical thinking			1				1						
C09	Everyday reasoning							1			1	1	1	1
C10	Creativity					1				1				
C11	Learning ability					1				1	1			
C12	Management			1				1						
C13	Documentation			1		1		1						
C14	Languages	1			1		1		1	1				
C15	Information and communication technologies	1	1			1	1				1			

3.4. The Survey SALM

The measurement method proposed consists of a Survey on Access to the Labor Market (SALM) for EHEA graduates which integrates evaluations of education (LE) and utility and repercussion (LU) of the 15 competencies identified in the previous section to measure the EQF-EHEA/MECES levels with other variables of interest for the analysis of employability and evaluation of study plans (Figure 4).

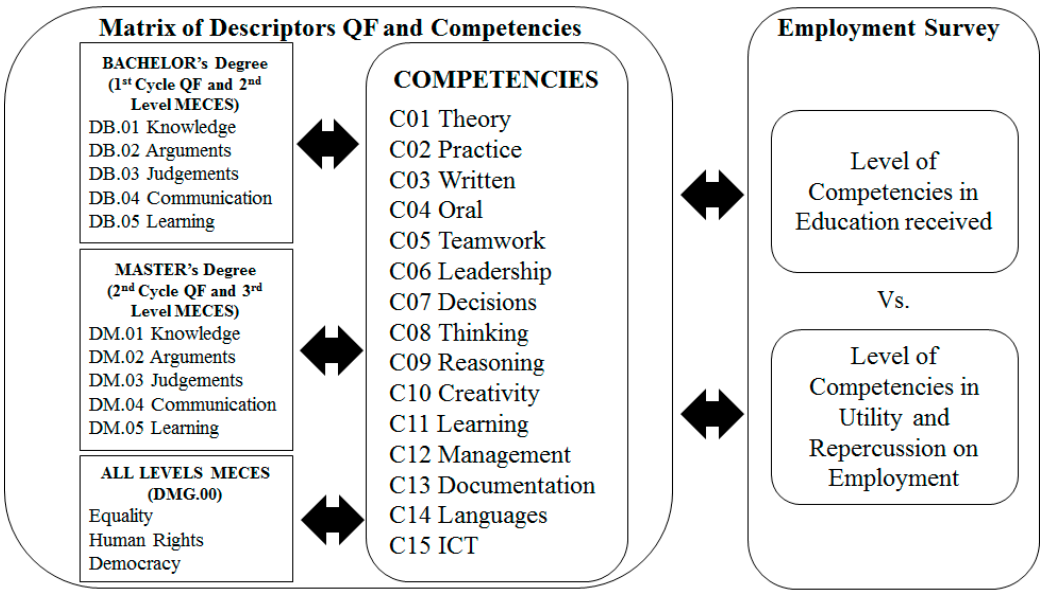

Figure 4. Descriptors *vs* competencies *vs* employment survey.

Each competency is assessed with an individual question which focusses on achievements; since it is considered that the process can be evaluated taking into account the perception of university graduates, three years after completing their studies.

The questionnaire presented the following distribution of question blocks:

A Profile of graduates (14 items for Bachelor's degree graduates and 12 items for Master's degree graduates)

B Professional profile:

- Employed during the course (Master's graduates) (eight items)
- First job after completing the course (Bachelor's and Master's graduates) (eight items)
- Currently employed (after three years of completing the Bachelor's or Master's degree) (nine items)

C Questions about standards of education and levels of utility (15 items)

D "Satisfaction with education received" and "satisfaction with current employment" (six items)

The survey was designed to be run online, with independent questionnaires designed for Bachelor's and Master's degrees—in both Spanish and English, based on the language which the course was taught in.

Each of the 15 questions was based on a five-point Likert scale, following the CHEERS methodology. The respondents were asked to click one option to proceed to the next question, so they had to provide 30 values: 15 for the level of education (LE) and 15 more for the level of utility (LU). Figure 5 shows a screenshot of the 15 questions in English.

The usefulness and effects in your current job of the following training skills 1-None, 2-almost none, 3-little, 4-some, 5-a lot, NA-Not applicable if you have not started your professional career		
Theoretical training	-Select-	-Select-
Practical training	-Select-	-Select-
Written expression: able to clearly express oneself in written essays adjusting the language style to the interlocutor and using specific and relevant vocabulary	-Select-	-Select-
Oral expression: able to clearly express oneself in conversations or debates adjusting the language style to the interlocutor and using specific and relevant vocabulary	-Select-	-Select-
Teamwork: Capacity for commitment to the team, a collaboration and work habit solving conflicts that might arise	-Select-	-Select-
Leadership: ability to lead work teams, meetings, supervise people	-Select-	-Select-
Decision making and problem solving: locating the problem, identifying the causes and alternative solutions, selection and assessment of the most ideal	-Select-	-Select-
Critical thought: ability to analyse, summarise and extract conclusions form an article (either an opinion or scientific)	-Select-	-Select-
Day-to-day reasoning: ability to look for contrary arguments to one's own opinion (theoretical, ideological, values, social conflict framework)	-Select-	-Select-
Creativity: ability to innovate, to have initiative, to develop ideas and of invention	-Select-	-Select-
The ability to learn	-Select-	-Select-
Management: time and resource management ability, develop plans, prioritise activities, identify the critical, set time frames and meet them	-Select-	-Select-
Documentation skill: consult relevant databases in the business field, consult specific magazines, expert's web browsing	-Select-	-Select-
Languages: knowledge of foreign languages	-Select-	-Select-
Information and communication technologies: knowledge of the most common tools and technologies (word processors, spreadsheets, e-mail, web, social networks)	-Select-	-Select-

Figure 5. A screenshot of the SALM.

3.5. Sustainability Indicators

Each participant p in the SALM gives an answer to the 15 competencies c, both for the level of education LE_{cp} and the level of utility LU_{cp}. LE and LU will then be taken from the average over all the participants and competencies for each level independently.

The indicator for measuring sustainability was the adequacy of or concordance between the education and its utility at the workplace. We defined adequacy as "LE-LU", with positive values indicating that the education level was greater than what was needed at the workplace, whereas negative values indicated good use of the standard of education in the workplace.

The analysis could however be performed for each of the 15 competencies, in order to obtain more information about the actions that should be taken by the stakeholders. Then, for each participant p, we can calculate the pair difference between LE_{cp} and LU_{cp} or $(LE\text{-}LU)_{cp}$; and for the sample as a whole, the average for each competency $(LE\text{-}LU)_c$:

$$(LE - LU)_c = \frac{\sum_{p=1}^{P}(LE - LU)_{cp}}{P} \quad (1)$$

The indicator for the competencies is straightforward, whereas the one for each of the descriptors of the framework needs fine-tuning. The value for each descriptor is the weighted average of the values of the competencies, where the conversion weighs $w_c{}^d$ are 0 or 1, depending upon the influence of the competence in the descriptor as dictated by Table 6 (1 corresponds to the relationships identified and depicted by letters, and 0 to the blank cells). Therefore:

$$(LE - LU)_d = \frac{\sum_{p=1}^{P}(LE - LU)_{dp}}{P} \quad (2)$$

where:

$$(LE - LU)_{dp} = \frac{\sum_{c=1}^{C}(LE - LU)_{cp} \times w_c^d}{\sum_{c=1}^{C} w_c^d} \quad (3)$$

As an example, descriptor 1 for the undergraduate degree will include and average out the values for C01 ($w_1^1 = 1$), C03 ($w_3^1 = 1$), C14 ($w_{14}^1 = 1$) and C15 ($w_{15}^1 = 1$). The weight of the rest of the competencies is 0 ($w_c^1 = 0$).

For both the competencies and the descriptors it is then necessary to determine whether the difference between education and utility is significantly different from 0. In this regard, we shall perform the traditional hypothesis test based on the paired comparison of individual values for the sample as a whole, for competencies or descriptors.

H_0: (LE−LU) = 0 vs H_1: (LE−LU) ≠ 0

H_0: $(LE-LU)_c = 0$ vs H_1: $(LE-LU)_c \neq 0$

H_0: $(LE-LU)_d = 0$ vs H_1: $(LE-LU)_d \neq 0$

In summary, the descriptors and competencies that show a significant difference between LE and LU may be altered by the HEI. We also considered that values of LE or LU over 3 were appropriate, whereas values those under that threshold indicated that the corresponding item needed attention.

4. Case Study

4.1. The Sampling Framework

The SALM was tested with Bachelor's and Master's graduates in the fields of Business and Marketing at a Spanish private institution of higher education (HEI). The HEI offers degrees affiliated with two Spanish public universities under the new EHEA. The Bachelor's degrees have a duration of four academic years, whilst the Master's lasts for one academic year. In order to assess their professional career, graduates were surveyed three years after completing their studies—the survey was conducted between 30 January and 3 March, 2014, instead of at the end of the Bachelor's or Master's course in 2010, 2011, and 2012. By allowing a sufficient period of time—until their current employment in 2014, graduates were able to assess their overall competencies, analyzing their usefulness and repercussions on their job.

The questionnaires were sent by email, which provided webpage access. The period for completion went from 30 January to 3 March 2014. Up to four reminders were given to complete the survey in cases of no response.

Two groups were identified: 2030 Bachelor's graduates and 1500 Master's graduates (1395 in Spanish and 105 in English). The survey was sent to all respondents in the study. The response rate was 12.6% (256) for Bachelor's degrees and 18.9% (283) for Master's degrees. Of the Bachelor's degree respondents, 57.4% were men, 96.1% Spaniards, and 71.5% were under 29 years. At the time of the survey, 75.3% were employed. In the case of the Master's respondents, 58.0% were men, 82.0% were Spaniards, and 68.9% were between 25 and 34 years of age; 85.2% were working at the time of the survey. In both cases, marketing was both the main degree (and the main employment sector (40%).

4.2. Results for Competencies

Table 4 includes the results. If the confidence level is 95% (*p*-value of 0.05), LE = LU for the average of the whole set of competencies. Individually, LU was higher for written expression, decision-making and problem-solving, critical thinking, everyday reasoning, learning capacity, management, documentation, languages, and ICT. LE was higher for theoretical education only.

Table 4. Statistics of paired samples: SALM Bachelor (*n* = 256).

	Competencies	Average LE	Stand. Dev. LE	Average LU	Stand. Dev. LU	Difference (LE-LU)	*p*-Value
C.01	Theoretical education	3.65	0.805	3.39	1.320	0.260	0.004
C.02	Practical education	3.88	0.948	3.94	1.236	−0.061	0.502
C.03	Written expression	3.47	0.973	3.65	1.332	−0.182	0.035
C.04	Oral expression	4.03	0.899	4.03	1.210	0.004	0.952
C.05	Teamwork	4.22	0.894	4.07	1.196	0.152	0.068
C.06	Leadership	3.70	0.948	3.70	1.306	−0.004	0.962
C.07	Decision-making and problem-solving	3.65	0.871	3.90	1.247	−0.247	0.004
C.08	Critical thinking	3.63	0.889	3.90	1.198	−0.273	0.001
C.09	Everyday reasoning	3.63	0.889	3.87	1.094	−0.242	0.005
C.10	Creativity	3.52	1.012	3.63	1.335	−0.117	0.182
C.11	Learning ability	3.53	0.936	3.92	1.269	−0.394	0.000
C.12	Management	3.52	0.977	4.04	1.173	−0.519	0.000
C.13	Documentation	3.27	1.110	3.73	1.324	−0.463	0.000
C.14	Languages	2.81	1.192	3.49	1.538	−0.680	0.000
C.15	Information and communication technologies (ICT)	3.48	1.058	3.98	1.277	−0.494	0.000
	Total competencies	3.60	0.960	3.82	1.270	−0.217	0.181

As for the Master's degree (Table 5), once again there were no overall differences. LU was higher for practical education, written expression, decision-making and problem-solving, management, documentation, languages and ICT. LE was higher for both theoretical education and teamwork.

Table 5. Statistics of paired samples: SALM Master (*n* = 283).

	Competencies	Average LE	Std. Dev. LE	Average LU	Std. Dev. LU	Difference (LE-LU)	*p*-Value
C.01	Theoretical education	3.75	0.804	3.37	1.325	0.381	0.000
C.02	Practical education	3.34	1.091	3.66	1.369	−0.320	0.001
C.03	Written expression	3.11	1.020	3.32	1.335	−0.211	0.012
C.04	Oral expression	3.63	0.941	3.66	1.258	−0.026	0.746
C.05	Teamwork	3.96	0.918	3.76	1.228	0.201	0.015
C.06	Leadership	3.60	0.889	3.69	1.311	−0.088	0.312
C.07	Decision making and problem solving	3.59	0.913	3.76	1.261	−0.175	0.032
C.08	Critical thinking	3.53	0.951	3.69	1.307	−0.165	0.062
C.09	Everyday reasoning	3.46	0.977	3.62	1.072	−0.160	0.109
C.10	Creativity	3.35	0.992	3.44	1.365	−0.093	0.306
C.11	Learning ability	3.40	0.972	3.52	1.332	−0.124	0.149

Table 5. *Cont.*

	Competencies	Average LE	Std. Dev. LE	Average LU	Std. Dev. LU	Difference (LE-LU)	*p*-Value
C.12	Management	3.55	0.882	3.79	1.283	−0.247	0.005
C.13	Documentation	3.08	1.069	3.37	1.401	−0.284	0.002
C.14	Languages	2.03	1.178	2.87	1.704	−0.835	0.000
C.15	Information and communication technologies	2.52	1.148	3.14	1.543	−0.619	0.000
	Total competencies	3.326	0.983	3.510	1.340	−0.184	0.117

It can be concluded that, on average, for both "level of education received" and "level of utility and repercussions on employment", there was a subtly lower assessment by Master's graduates (LE: 3.33 and LU: 3.51) than by Bachelor graduates (LE: 3.6 and LU: 3.82). There was greater homogeneity in the results for the assessment of LE and greater heterogeneity in the responses for LU.

Figure 6 below reflects the results on a scatterplot comparing "level of education" with "level of utility and repercussion on employment" for the 15 items evaluated by Bachelor's and Master's graduates. The solid line indicates equality between education and utility.

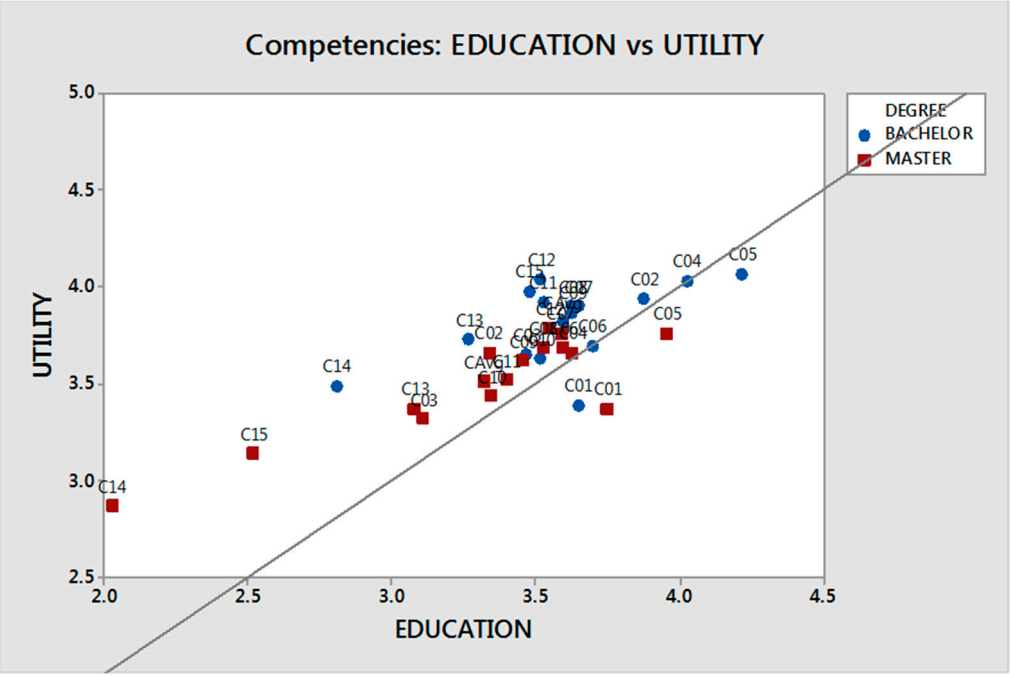

Figure 6. Competencies: education *vs.* utility (bachelor's and master's degree).

It seems clear that Bachelor graduates value both competencies C01 (Theoretical education—LE = 3.65; LU = 3.39; LE-LU = 0.260), and C05 (Teamwork—LE = 4.22; LU = 4.07; LE-LU = 0.152), with the LE received being higher compared to LU, whilst among Master graduates the LE received was higher compared to LU in employment in competency C011 (Theoretical education—LE = 3.75; LU = 3.37; LE-LU = 0.381), which indicates an excess in "education" *versus* "utility and repercussion on employment". Thus, it would be worth suggesting an analysis of the HEI, to revise its study plans, and teaching methodology.

It was detected that, for Master graduates, the LE of competencies C14 (Languages = 2.03) and C15 (ICT = 2.52), received a lower assessment compared to the rest of competencies analyzed, having a "repercussion on employment" of LU = 2.87, and LU = 3.14, respectively. Along these lines, for Bachelor graduates, the LE of competency C14 (Languages = 2.81), received a lower average assessment compared to the rest of competencies analyzed, having a "repercussion on employment" of LU = 3.49.

This situation could merit an analysis to ascertain whether there is an educational need among Bachelor students in relation to the specific competencies of "Languages", as well as "Languages and ICT" for Master students, aimed at covering the demands of the current labor market.

4.3. Results for Descriptors

The Bachelor program indicates (Table 6) that the "level of utility and repercussion" is significantly higher than the "level of education" in all the specific competencies for Bachelor graduates. That is not the case for the general descriptor.

Table 6. Statistics of paired averages of descriptors of QF-EHEA-1st and 2nd Cycle MECES (BACHELOR) (n = 256).

	Descriptors	Average LE	Std. Dev. LE	Average LU	Std. Dev. LU	Difference (LE-LU)	p-Value
DMG00	MEGE General	3.83	0.703	3.95	0.995	-0.113	0.090
DB01	QF-EHEA-1ºC-01 ≈ MEGR01: have demonstrated knowledge and understanding in a field of study that builds upon their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study;	3.35	0.699	3.63	1.096	−0.274	0.000
DB02	QF-EHEA-1ºC-02 ≈ MEGR02: can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study;	3.77	0.679	3.91	1.003	−0.139	0.025
DB03	QF-EHEA-1ºC-03 ≈ MEGR03: ability to gather and interpret relevant data to inform judgments that include reflection on relevant social, scientific or ethical issues;	3.51	0.719	3.85	1.045	−0.337	0.000
DB04	QF-EHEA-1ºC-04 ≈ MEGR04: communicate information, ideas, problems and solutions to both specialist and non-specialist audiences;	3.52	0.728	3.74	1.105	−0.227	0.001
DB05	QF-EHEA-1ºC-05 ≈ MEGR05: have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy.	3.45	0.746	3.82	1.062	−0.367	0.000
	Total descriptors	3.57	0.712	3.81	1.051	−0.243	0.019

As for the Masters programs (Table 7) it is also the case that the "level of utility and repercussion" was significantly higher than the "level of education" in all the specific competencies for Master graduates.

Table 7. Statistics of paired averages of descriptors of QF-EHEA-2nd and 3rd cycle MECES (MASTER). (n = 283).

	Descriptors	Average LE	Std. Dev. LE	Average LU	Std. Dev. LU	Difference (LE-LU)	p-Value
DMG00	MEGE General	3.670	0.756	3.715	1.044	-0.0447	0.526
DM01	QF-EHEA-2 °C-01 ≈ MEMA01: have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with the first cycle, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context;	3.145	0.717	3.396	1.167	−0.2509	0.000
DM02	QF-EHEA-2 °C-02 ≈ MEMA02:can apply their knowledge and understanding, and problem solving abilities to new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study;	3.468	0.734	3.616	1.104	−0.1487	0.028
DM03	QF-EHEA-2 °C-03 ≈ MEMA03: have the ability to integrate knowledge, and handle complexity, and formulate judgments with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments;	3.088	0.752	3.404	1.213	−0.3162	0.000
DM04	QF-EHEA-2 °C-04 ≈ MEMA04: can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;	3.086	0.858	3.366	1.256	−0.2796	0.000
DM05	QF-EHEA-2 °C-05 ≈ MEMA05: have the learning competencies to allow them to continue to study in a manner that may be largely self-directed or autonomous	3.099	0.738	3.432	1.132	−0.3333	0.000
	Total descriptors	3.259	0.760	3.488	1.153	−0.2289	0.092

Figure 7 reflects the results on a scatterplot comparing the "level of education" *versus* "level of utility and repercussion on employment" for the Qualifications Framework of Bachelor and Master.

All the results are above the threshold of 3 and with U > E, proving a strive towards employability of the graduates and a sustainability of the HEI within the QF-EHEA.

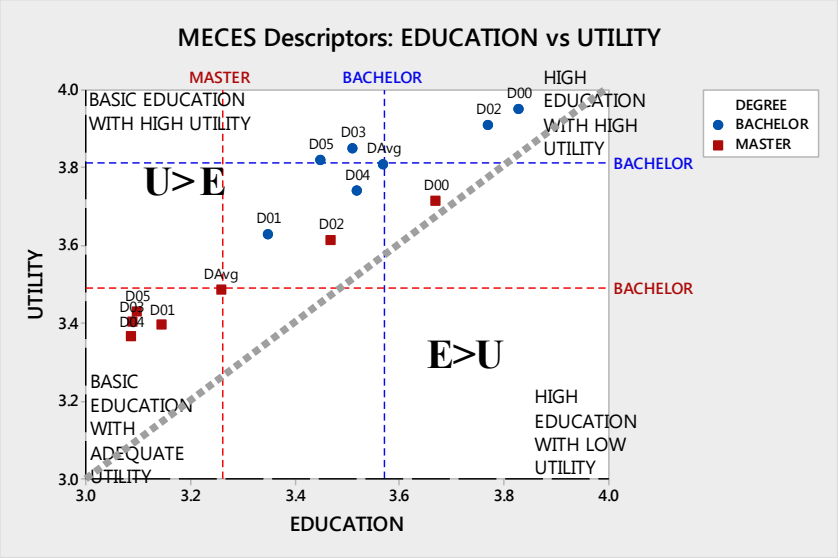

Figure 7. Descriptors: education *vs.* utility (Bachelor's and Master's degrees).

All the QF-EHEA/MECES descriptors for Bachelor's and Master's degree level had values above the total average assessment, for both the evaluation of "education received" and "utility and repercussion on employment"—the average "level of education" for Master's graduates was 3.26 *versus* 3.49 for "level of utility and repercussion", whilst among Bachelor's graduates the average "level of education" was 3.57 *versus* a "level of utility and repercussion" of 3.81.

Based on the evidence, it is also possible to conclude that no descriptors with a high "level of education" and low "utility and repercussion on employment" were identified.

Among Bachelor's graduates we observed a better assessment of the "education received" and "utility and repercussion" for each descriptor in comparison with the assessments of Master's graduates.

The general MECES descriptor 0 obtained a higher score for both "education" and "utility" compared to the rest of the descriptors in the Qualifications Framework for both Bachelor's and Master's graduates.

The descriptor, 2nd QF-EHEA-2 °C-02: *students can apply their knowledge and understanding, and problem-solving abilities in new or unfamiliar environments within broader—or multidisciplinary—contexts related to their field of study*, for both for Bachelor's and Master's graduates, obtained the highest score, for both "education" and in "utility and repercussion on employment" (Bachelor's degree: LE = 3.77 and LU = 3.91; Master's degree: LE = 3.468 and LU = 3.616), as compared with the rest of the European qualifications framework descriptors.

There was a better response in terms of assessment for both LE and LU from Bachelor's graduates than from Master's graduates. This could be explained by the duration of Bachelor's degrees and Master's degrees in Spain which, at the time of the study, were four academic years for Bachelor's degrees, as opposed to one academic year for Master's degrees.

The results also lead to the conclusion that there was a greater positive and significant linear correlation between LE and LU for Master's than for Bachelor's courses, with an average correlation

of 0.53, and a critical level of 0.000 for Master's. Therefore, the higher the LE, the higher the LU for graduate qualifications, both for level 1 and level 2 in the QF-EHEA/MECES.

It could also be stated that there is greater homogeneity in the assessments of LE and greater heterogeneity among the responses for the assessment of LU. This is due to the professional status of the graduates in each case and, therefore, the demand for competencies that they observe in the workplace.

As for the decision-makers, the management of the education center considered that the results matched expectations. This would demonstrate the suitability of the levels of the descriptors in the European QF-EHEA and EQF Qualifications Framework when attempting to understand current employment needs at this HEI, although more samples would provide more robust conclusions.

5. Conclusions

In the context of a global and dynamic labor market within a digital environment, graduate competencies require to be constantly assessed and flexible in the face of the changes resulting from surveys to monitor the views of employers, graduates and other stakeholders, who may or may not validate the competencies analyzed. The European Qualifications Framework descriptors can thus be measured effectively.

Likewise, there seems to be a need to analyze and quantify the European Qualifications Framework from the standpoint of graduates, in order to detect whether these descriptors contribute to understanding the equilibrium between education and utility, with adequate correspondence between the LE at any HEI and the LU required in the workplace. If the framework can be measured, then it is useful for decision-making. Moreover, if the measures relate to employability, the QF-EHEA descriptors could be maintained over time, verified for adequacy, and contributes to the sustainability of the higher education system.

We have provided a methodological framework based on a SALM (Survey on Access to the Labor Market) for quantitative measurement of the Higher Education framework in Europe. For the first time, to our knowledge, a measure based on high-level descriptors rather than individual competencies has been developed (RQ1: Is the Framework measurable?).

Moreover, since the framework may be studied quantitatively, its sustainability is addressed. As the EHEA framework helps decision-makers to address employability needs at both country and HEI levels, the framework is sustainable (RQ2: Is it sustainable?).

In terms of validation, its application at an HEI in Spain has proven satisfactory, shedding light on how this center should adjust to the changing labor markets to achieve sustainability, even if the response rate was not high. The analysis of the results of the SALM concludes that LU values are higher than LE, both for Master's and Bachelor's graduates.

This research should be improved and completed with a survey among employers. The participation of employers will provide an assessment of graduate education in relation to necessary competencies in a real professional environment. The opinion of lecturers involved in teaching these courses is also important to complete this study.

Further choice of competencies, as well as additional coverage weighting that transforms them into descriptors are of course subtle for proposal adaptations of the competencies analyzed. However, this should be approached from the hypothesis of maintaining a valid map of competencies to compare

courses within a common European framework for the various levels of the European QF-EHEA and EQF Qualifications Frameworks.

In summary, the response to the initial question raised in this work, of whether the European QF-EHEA and EQF Qualifications Frameworks are measurable and sustainable, can be approached by mentioning that sustainability of the European QF-EHEA Higher Education Framework and the frameworks of equivalent qualifications in each country depend on a continuous monitoring process by HEI interest groups, which would enable any excesses or deficiencies in the education system to be detected among graduates of the different levels examined in terms of their degree of utility and repercussion on the labor market. Education centers could thus adapt their mission, study plans, and any other plans of action to respond to the needs identified. This is further supported by the review of the ESG published in May 2015 [37].

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Authors Contributions

All authors contributed to all parts of the research, although Gracia Serrano took the leading role while performing the research tutored by F. Javier Otamendi, who formalized the methodology and decided on the statistical tools. Francisco Llamazares designed and maintained the database that was analysed by Gracia Serrano. The discussion was a team task, while drafting and editing was handled by Serrano and Otamendi.

Conflict of Interests

The authors declare no conflict of interest.

Appendix

Table A1. An example of the correlation of competencies.

	CHEERS Competencies		**Competencies García-Aracil, Adela; van der Velden, Rolf (2008) [17]**
1	Broad general knowledge	GAV.29	Broad general knowledge
2	Cross-disciplinary thinking/knowledge	GAV.22	Cross-disciplinary thinking/knowledge
3	Field-specific theoretical knowledge	GAV.30	Field-specific theoretical knowledge
4	Field-specific knowledge of methods	GAV.23	Field-specific knowledge of methods
5	Foreign language proficiency	GAV.32	Foreign language proficiency
6	Computer	GAV.05	Computer
7	Understanding complex social, organisational and technical systems	GAV.14	Understanding complex social, organizational and technical systems
8	Planning, co-ordinating and organising	GAV.02	Planning, coordinating and organizing
9	Applying rules and regulations		
10	Economic reasoning	GAV.07	Economic reasoning

Table A1. *Cont.*

	CHEERS Competencies		Competencies García-Aracil, Adela; van der Velden, Rolf (2008) [17]
11	Documenting ideas and information	GAV.15	Documenting ideas and information
12	Problem-solving ability	GAV.09	Problem-solving ability
13	Analytical	GAV.21	Analytical
14	Learning abilities	GAV.31	Learning abilities
15	Reflective thinking, assessing one's own work	GAV.17	Reflective thinking, assessing one's own work
16	Creativity		
17	Working under pressure	GAV.06	Working under pressure
18	Accuracy, attention to detail	GAV.16	Accuracy, attention to detail
19	Time management	GAV.04	Time management
20	Negotiating	GAV.01	Negotiating
21	Fitness for work		
22	Manual		
23	Working independently	GAV.18	Working independently
24	Working in a team	GAV.13	Working in a team
25	Initiative	GAV.12	Initiative
26	Adaptability	GAV.19	Adaptability
27	Assertiveness, decisiveness, persistence	GAV.11	Assertiveness, decisiveness, persistence
28	Power of concentration	GAV.28	Power of concentration
29	Getting personally involved	GAV.20	Getting personally involved
30	Loyalty, integrity	GAV.25	Loyalty, integrity
31	Critical thinking	GAV.27	Critical thinking
32	Oral communication	GAV.10	Oral communication
33	Written communication	GAV.26	Written communication
34	Tolerance, appreciating of different points of view	GAV.24	Tolerance, appreciating of different points of view
35	Leadership	GAV.08	Leadership
36	Taking responsibilities, decisions	GAV.03	Taking responsibilities, decisions
37	Participating in social and industry or professional networks		
38	Ability to work in an international context		
39	Appreciation of diversity and multiculturality		
40	Accountability in completing tasks		
	Total	**32**	

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