QUALITY PAPER
SMART-QUAL: a dashboard for quality measurement in higher education institutions

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Abstract

Purpose – The paper aims to define a dashboard of indicators to assess the quality performance of higher education institutions (HEI). The instrument is termed SMART-QUAL.

Design/methodology/approach – Two sources were used in order to explore potential indicators. In the first step, information disclosed in official websites or institutional documentation of 36 selected HEIs was analyzed. This first step also included in depth structured high managers' interviews. A total of 223 indicators emerged. In a second step, recent specialized literature was revised searching for indicators, capturing additional 302 indicators.

Findings – Each one of the 525 total indicators was classified according to some attributes and distributed into 94 intermediate groups. These groups feed a debugging, prioritization and selection process, which ended up in the SMART-QUAL instrument: a set of 56 key performance indicators, which are grouped in 15 standards, and, in turn, classified into the 3 HEI missions. A basic model and an extended model are also proposed.

Originality/value – The paper provides a useful measure of quality performance of HEIs, showing a holistic view to monitor HEI quality from three fundamental missions. This instrument might assist HEI managers for both assessing and benchmarking purposes. The paper ends with recommendations for university managers and public administration authorities.

Keywords Quality performance, Higher education institutions, Dashboard, Quality assurance

Paper type Research paper

1. Introduction

Higher education quality management system (QMS) is often criticized for being too process oriented, box-ticking and insufficiently focused on consequential and generalizable outcomes. One of the reasons underlying these critics relies on the fact that QMS tends to rely on a large quantity of quality indicators, which makes their accuracy and timely analysis

difficult, and consequently undermines their adequate use for decision-making at different levels (strategic, tactical or operational).

Additionally, most existing QMSs focus on the first higher education institutions (HEI) mission, namely, teaching and learning, neglecting the second and third ones. HEIs are expected to excel at three different missions. The first one, "teaching and learning", was the first mission assigned to HEIs. The second one is "research", which refers mainly to knowledge creation. The last one considered is the "relation with the society", which in some papers is termed as "transfer" or "knowledge transfer", that encompasses other types of activities more socially and cultural driven. The three missions are relevant and important, and at the same time interconnected. Some HEIs might put more efforts in one direction compared to another and, consequently, emphasize a given mission; yet, excellent HEI cannot neglect any of them (Marimon *et al.*, 2019; Hossain *et al.*, 2018). In addition, an outstanding performance seems not to be enough, as the globalization of the higher education system imposes competition. In this setting, the quality of service acquires a relevant role and becomes a way to obtain sustainable competitive advantages (Abdullah, 2006; Sadiq Sohail and Shaikh, 2004).

Recently, in 2015, the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) were revised (first version in 2005) and approved. Despite they not being mandatory or prescriptive, the set of standards and guidelines in Part 1 of the ESG contributes to ensure that the internal QMS of HEIs in the European Higher Education Area (EHEA) adheres to the same set of principles and that the processes and procedures implemented are modeled to fit the purposes and requirements. Since then, these standards have been accepted and extensively used for assessment aims in Europe. There is a general consensus among HEIs and the institutional agencies for quality assurance on the use of these ten standards. What is not so clear is how to measure each of them. Additionally, these standards suffer from an important limitation: they only cover the first mission, "teaching and learning", overlooking the relevance of the other two. Given the increasing role of HEIs as drivers for economic development and growth of regions, it is paramount to revisit the current assessment tools and make sure all three university missions are represented.

Rooted in this context, this study aims at covering the lack of a comprehensive framework of harmonized quality indicators and benchmarks. This is part of an Erasmus + Project, funded by the European Commission, which aims at designing an instrument to assess and monitor quality in HEI. In this paper, we report the process of creating the instrument, which contains a set of harmonized quality indicators at European level to measure, monitor and assess HEI main processes. Indicators have been arranged in three main dimensions, according to the main roles that are tacitly or explicitly expressed in the mission of any HEI (learning and teaching; research; and relations with the society), and are classified according to the three decision-making levels: "strategic", "tactical" and "operational". The dashboard is expected to cover the ESG Standards 2015 (ENQUA, 2015), and it is meant to be applied by HEIs within their QMS, making the process more efficient, comparable and effective.

The remainder of the paper is organized as follows. We first review the "state of the art" on the assessment of management quality in HEIs. This section also provides a theoretical framework that enables the conceptualization of quality of this setting. The section finishes presenting the structure of the instrument. The third section describes the methodology used, and the fourth is devoted to the result, which mainly is the definition of the instrument termed SMART-QUAL. Some debate and conclusions are established in the fifth and last section.

2. Literature review

2.1 Quality management systems

Since the beginning of 2000, and under the scope of the Bologna Process and the Lisbon Strategy, quality assurance (QA) has gained additional relevance in the European landscape,

mainly because it has been considered from the outset as one of the most important drivers for building the EHEA. According to Cardoso and Rosa (2018), the early communiqués issued from the Bologna ministerial conferences clearly emphasized the need for national QA systems to establish a common framework of reference and to disseminate best practice, to develop mutually shared criteria and methodologies on QA, while also stressing the need for cooperation between nationally recognized agencies with to the purpose of enhancing the mutual recognition of accreditation or QA decisions. This has led to the establishment of a significant number of national QA agencies in the first decade of this century, as well as to the creation of some European-level organizations, namely the ENQA (European Association for Quality Assurance in Higher Education) and the EQAR (European Quality Assurance Register for Higher Education).

In 2005, the developments around QA led to the drafting of the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG), through the joint work of ENQA, the EUA, EURASHE and the former National Unions of Students in Europe (ESIB, currently ESU). The ESG was defined as a set of generic and non-prescriptive principles in QA, "meant to be a framework to guide the implementation of internal and external quality assurance systems in the European higher education landscape" (Cardoso and Rosa, 2018). In 2015, the ESG was revised, leading to a new version of these standards that is now in use across Europe (ENQUA, 2015).

Part 1 of the ESG comprehends a set of standards and guidelines for the design and implementation of internal quality assurance systems. Although not being mandatory or prescriptive, these standards and guidelines are widely used by HEIs in the EHEA when implementing their QMS. This guarantees that these systems adhere, to a certain extent, to the same set of principles, and that the processes and procedures implemented are modeled to fit the purposes and requirements of their contexts. Additionally, and at the national level, several quality assurance agencies affiliated with ENQA audit, certify or accredit the HEIs QMS, based on compliance with the ESG. According to Manatos *et al.* (2017a), this practice seems to be growing, since the usual mechanism of periodically accrediting or evaluating study programs "is costly and can cause significant disruption to the normal activities of the institutions". Also, assessing institutions QMS is in line with the idea that HEIs should, ultimately, be responsible for assuring their own quality, whilst the role of quality assurance agencies should only be to certify that it is happening.

Despite the influence of the ESG and the national accreditation agencies in institutions' development of their QMS, each institution still has sufficient autonomy to design and implement its QMS in line with its institutional mission and culture (ENQA, 2015; Rosa and Amaral, 2014; Santos, 2011). Additionally, the ESG Part 1 tends to be too much focused on teaching and learning, not addressing the other HEIs two main processes, research and relation with society. In fact, in a study on the ESG, Manatos *et al.* (2017b) concluded that this quality management model is not a truly integrated one, since it is mainly focused on teaching and learning, neglecting research and the third mission. In addition, they [ESG] leave aside quality management principles more directly linked with a systemic and holistic approach to quality, such as the system approach principle". According to the authors, this is an important gap in the ESG that has been overcome by some European accreditation agencies through the introduction of additional standards and guidelines to account for research and the relation with society, as it is the case in Portugal. Even if in their study the authors analyzed the initial version of the ESG, issued in 2005, they highlight the fact that the 2015 version does not radically change the scope of the ESG, since the changes introduced are mainly at the level of "teaching and learning", not paying particular attention to the other institutional processes.

HEI are also responsible for other missions. While in quality assessment processes at institutional level attention is mainly put on the "teaching and learning" mission, when evaluating the performance of HEIS in international rankings and league tables, the

"research" mission seems to take a predominant role. In either one case or the other, the third mission is typically neglected, one of the main reasons being the difficulty in collecting homogenous information for all HEIs that make the results comparable. As Marhl and Pausits (2011) stated a decade ago, society is constantly evolving, and HEIs need to adapt their structures and readjust their missions to these new challenges. For instance, nowadays HEIs are trying to figure out how they can contribute to achieve the Sustainable Development Goals (SDG) that were set up in 2015 by the United Nations General Assembly and are intended to be achieved by 2030. These SDG were not considered in the ESG, as they were both published in the same year, nor were other important issues such as inequalities. There is therefore an urgent need to update the indicators and embrace all the dimensions.

Aligning a QMS with the ESG and society's current trends is not an easy task. It needs to be simple enough but without narrowing to much its scope. HEIs' main institutional processes need to be considered and included with a sufficient level of integration. This is in line with the idea vehiculated by the European University Association (2010) which refers that "institutional quality management requires a comprehensive, all-encompassing approach". Or, as mentioned by Manatos *et al.* (2017a), HEIs QMS need to be integrated, with integration being understood as the development of quality management mechanisms within institutions as "part of their global management systems, covering different processes and organizational levels while including the implementation of a whole set of principles that underlies the definition of QM." Other authors have also emphasized this need for integration, namely when highlighting that quality management should be linked with institutions' strategic management (Gover *et al.*, 2015) or that quality management initiatives should be weaved into the institutions' strategic plan (Cruickshank, 2003; Bender and Siller, 2006).

According to Manatos *et al.* (2017a), there are indications in the literature that "universities are increasingly interested in integrating their main activities and consequently their management practices". However, the literature also emphasizes that the level of QMS integration is not yet as developed as it would be desirable. On one hand, as discussed above, QMS are still too much focused on teaching and learning; on the other hand, these systems keep being treated as a separate area, run by an independent department and not as an integrated part of the institution overall management and governance system. Taking as an example the case of Portugal, research has shown that institutions' QMS tends to be highly focused in teaching and learning even if addressing the other two main processes (Cardoso *et al.*, 2017). The centrality of teaching and learning was particularly evident in the quality assurance mechanisms implemented by the institutions (e.g. procedures to operationalize the teaching and learning process; student surveys; self-assessment and quality monitoring indicators for different processes, but with a special focus on teaching and learning; and appraisal systems for academic and non-academic staff). Also, the information support systems that institutions have developed within their QMS tend to be focused on the teaching and learning process, even if some institutions have already more comprehensive systems, encompassing other processes such as research and third mission.

Information support systems are a very important aspect when implementing a QMS, since having adequate data and information is the basis for sound decision-making. On the same vein, one of the ESG Part 1 standards is "Information Management," and it postulates that "Institutions should ensure that they collect, analyze and use relevant information for the effective management of their programs and other activities." Usually, information systems of HEI are fed by a panoply of data, including surveys to internal and external stakeholders, reports produced under internal and external review processes and quality indicators, namely graduates' employability and student success rates. The challenge is managing these data in order to enable taking right decisions, at the different government levels.

2.2 Quality indicators

Quality indicators are indeed paramount to monitor, ensure and improve the quality of higher education systems, institutions and processes. In fact, having a suitable set of indicators to monitor, measure, process, store and report information and data related to different processes is core in any HEI QMS (SQELT, 2020). Assuming, as Lieber (2019, p. 77), that indicators are "concepts that represent qualitative and quantitative information and data, which indicate functional qualities (. . .) of institutional, organizational or individual performance providers", they do provide information about the degree to which quality objectives are being met, which is "indispensable for any systematic approach to quality management".

As such QMSs need quality indicators, these indicators need to reflect the different processes occurring within an HEI, while addressing the different decision-making levels (strategic, tactic and operational) if the goal is to have a broad, encompassing and integrated QMS. Additionally, in order to be efficient and effective, QMS do not need a large amount of quality indicators, but instead a small number of them, covering the more relevant issues for the quality of each institutional process, and also being sufficiently accurate to allow for their timely analysis and integration in governance and management decision-making. Different studies have searched for this "best" set of quality indicators, although most of the times with a sectorial focus. In fact, it is possible to find in the literature the proposal of indicators for teaching and learning (Lieber, 2019; SQELT, 2020), research (Bucur *et al.*, 2018; Bruni *et al.*, 2020; Biscaia *et al.*, 2020) or relation with society (Biscaia *et al.*, 2020; Bruckmann *et al.*, 2019). It is, however, harder to find studies reporting a set of indicators addressing the three processes in conjunction and with a link to the design of an effective and efficient QMS.

The few studies we were able to identify in the literature include the one by Palomares-Montero and García-Aracil (2011), who proposed a list of 40 indicators arranged under the topics of teaching, research, knowledge transfer and combinations of these three, which is in line with the aim of the SMART-QUAL project. The list resulted from information collected in Spain through a Delphi methodology, based on a panel composed of 37 experts in senior academic and management positions, with in-depth knowledge of Spanish university evaluations. The expert group included university rectors, university managers, university vice-rectors and technology transfer office managers. Up to six indicators were selected as most important to assess teaching (among them, "results of the teaching survey" and "ratio PDI to students"). Other nine were selected for "research" (e.g. "% PDI producing JCR"; "number of research periods granted (sexenios, in Spanish)"). There were also six additional indicators for "knowledge transfer" (e.g. "number of spin-offs").

Similarly, Hernandez-Diaz *et al.* (2020) proposed and validated a measurement scale for integrating performance in universities with a global Latin-America perspective. Empirically, their work combined a systematic literature review on the performance of universities, which allowed them to propose the measurement scale, with a survey addressed at academic and administrative staff members of two Colombian private universities to validate the scale. The systematic literature review undertaken allowed the authors to identify the performance indicators that more often appear in the literature as addressing both the academic and administrative subsystems of the universities' performance. In particular, for the academic subsystem, the authors identified the most used indicators for research, education and extension, which is again in line with the SMART-QUAL project.

Another example is the work of Sánchez-Barrioluengo (2014), who provides a critical reflection on the "one-size-fits-all" model, which conceptualizes universities as centers of excellence in education, research and third mission. This study suggests a set of 22 indicators gathered in three dimensions (i.e. the three missions) and finds a positive correlation between the second and third missions, but a negative one between these two missions and the first mission. In other words, it seems that those HEIs that excel in the teaching dimension are overlooking the other missions. Consequently, the study raises

unrealistic expectations related to the capacity of universities to equally excel in these three roles simultaneously.

3. Methodology

Due to the relevance of the ESG for the implementation of QMS in the European HEIs, the scoreboard is expected to include quality indicators aligned with the standards of ESG Part 1, as discussed in the previous section, but also current trends that HEIs are now facing and that impact their missions (e.g. integration of the SDGs). To this end, the QIS has been organized around three modules (teaching and learning, research and relation with society). Given the practical nature of a QMS, it was deemed necessary to have a strong QIS, which was based on indicators emerging from the literature review, but also from practitioners, that is, listening to the voices of quality assurance agencies and the technical staff that run quality assessment units in HEIs, and therefore, which are the ultimate responsible for the implementation of QMS.

Accordingly, the process started with the collection of indicators. Two main sources were consulted at this stage: (1) the items currently used in a sample of European universities, which were analyzed and contrasted with relevant managers directly related with the quality systems of these HEI, and (2) a large literature review specialized in the topic. The next stage consisted in the aggregation of the indicators collected from both sources and their grouping in the three main missions. Section 4 explains how these stages were conducted and the results obtained.

For a better understanding, Figure 1 graphically summarizes the process followed for the identification and definition of the indicators to be included in the SMART-QUAL dashboard. Following Churchill's (1979) framework to define measurement scales, and its subsequent update by Rossiter (2011), we started by diving deeper into the topic. Once the domain is clear, a list of items is generated. After several rounds of grouping and refining, a final set of items is proposed, arranging them in modules and standards.

A set of criteria was established previously to the collection of indicators:

(1) Indicators should refer at least to one of the key mission of HEIS: (1) "teaching and learning", which measures processes around knowledge transfer and development of competences in students; (2) "research", which deals with all processes around knowledge generation and dissemination; and (3) "relations with society", that refers to all processes around the impact to society, economy, environment or the engagement of stakeholders.

(2) The indicators will be aligned in a structured catalogue according to the three main aforementioned levels of decision-making (strategic, tactical and operational).

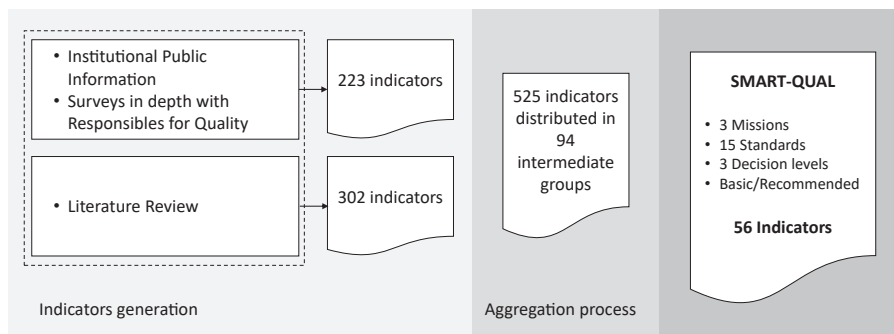(3) Indicators will be listed without any order or importance of prioritization.

Figure 1.
Process for the definition of the SMART-QUAL

(4) Indicators should have a correct and clear time reference.

(5) Indicators should be aggregated and disaggregated to fit the purpose of each analysis. This requires a high degree of data granularity, and a consistent catalog of levels for codification.

(6) Gender analysis is taking a high relevance in policymaking. Also ethnicity, maturity or social background are other important inequality dimensions in higher education that should be somehow covered.

(7) Indicators should be simple and easy to understand in order to enable comparison between different contexts (units, years, regions, countries, etc.)

These requirements were set with the ultimate goal to obtain an instrument flexible enough to be used by managers at different levels in the HEI organization.

4. Construction of the instrument
4.1 Quality management indicators used in HEIs
In this initial stage, we wanted to map out the state of the art of the quality management system of HEIs. Particularly, we were interested in collecting quality indicators use by HEIs spread over several European countries. Based on the partners in the consortium, we selected five countries: Portugal, Spain, Belgium, Lithuania and Italy. A template was designed to frame the data collection. This stage involved desk research (analysis of institutional documents, such as quality manuals, strategic plans, institutions' websites, etc.), combined with formal interviews with managers of the QMS.

A total of 36 institutions were analyzed. The sample included 21 universities, four polytechnic institutes, two universities of applied sciences, seven schools and two colleges. While 27 of them have public ownership, the remaining 9 are private. Regarding their size, we wanted to have a sound mix, reflecting the various realities that exist. Therefore, the sample comprises small institutions with less than 5,000 students (12 HEIs), medium-sized ones with students ranging from 5,000 to 15,000 (12 HEIs), as well as large institutions with more than 20,000 students (12 HEIs). In all, 12 institutions have only one campus, while 24 of them are located at multi-campuses. Furthermore, most of the HEIs are comprehensive (24), with only eight having a specific character. Finally, while 20 are located in metropolitan cities (Milan, Barcelona, Lisbon, Vilnius and Brussels), 16 are placed in secondary cities.

The reasons for the selection of these institutions are varied, ranging from the characteristics of the institutions themselves (e.g. history, dimension, representativeness and relevance within the national higher education systems, good positions in international rankings, reputation), to the ease of contact with relevant people within the institution (augmenting the possibility of collecting reliable and valid information on the QMS), the availability of public information on the QMS, including when searching the institutional website (e.g. on the process and the role played by each body, in a transparent way), the existence of well-structured and integrated governance and management systems, interested in promoting the quality of the nuclear processes and their results, ensuring the involvement of all stakeholders or the maturity level of the QMS.

In all the analyzed institutions, the QMS addresses the nuclear process of "teaching and learning". As for the "research" nuclear process, it is included in the QMS of 30 institutions, while "relations with society" is covered in the QMS of 29 institutions. Thirteen institutions referred to have other processes addressed by their QMS, namely processes related to the overall governance and management of the institution (e.g. strategic processes; directional plan; management; planning, evaluation and improvement), the management of different support processes (resources; information and advertising; human resources; innovation; finances; buildings and safety; environmental sustainability; information and communication systems

and infrastructures; technical-juridical; distance learning; services and cultural units; project management). Internationalization is also a process referred to as being covered by some institutions' QMS.

All the selected institutions have a QMS with a sound maturity level, although not all of them have been certified by an external agency. In Belgium, such certification has not occurred in the three universities analyzed, but in all of them the study programs have been certified according to the ESG and research is also subject to review processes. In Italy, all the institutions have been accredited by ANVUR (Italian National Agency for the Evaluation of Universities and Research Institutes), which includes an external assessment of their quality assurance systems. In Portugal, all but one institution have their QMS certified by the Portuguese quality assurance agency (A3ES). The institution without this certification has its QMS certified according to the ISO 9001:2015 standard. In the Lithuanian case, the assessment of the QMS is a part of the institutional or study programs evaluation/accreditation. As such, although the QMSs have not been formally certified, they have been externally reviewed. As for the Spanish institutions, the situation is somewhat more diverse: some institutions have their QMS certified by an external agency (4 HEIs), while in the others the QMS is externally assessed under the study programs accreditation system. Furthermore, in one HEI, the system has been externally assessed according to the EFQM model (2003–2006) and the ISO 9001 standard (2006–2009), and since 2010, the institution has implemented its integrated system of service quality management. Two institutions have systems that have not been certified nor follow any international standard or quality model; yet, they rely on a self-developed model based on key performance indicators for several dimensions.

The above information was contrasted and discussed with relevant key informants from each institution. Participants were classified in two groups: (1) strategic, that is, top managers responsible for internal quality assurance systems (e.g. vice-rector for quality), and (2) operational, that is, those persons responsible for the execution of the quality assurance system (e.g. the Internal Quality Assurance Office). A balance between the two profiles was guaranteed (19 strategic and 27 operational). A total of 33 experts were interviewed, with sessions that lasted an average of more than one hour. A total of 26 of these experts had more than 5 years of experience in quality management, and five of them accounted for more than 20 years. A protocol was designed for these interviews. The interviews were recorded and transcribed and stored in a database.

Resulting from this process, 223 quality indicators were identified: 201 of them were considered to be quantitative indicators, while 22 were classified as qualitative indicators. Most of the indicators collected (208) covered only one mission (85 the "teaching and learning", 63 "research" and 60 "relation with society". According to the decision-making level, 117 of the indicators referred to the strategic level, 31 were tactical and 30 operational. The remaining 106 indicators fit well with more than one decision-making level at the same time.

4.2 Quality management items extracted from the literature
We also embarked in a comprehensive review of the literature, looking for relevant indicators to include in the dashboard. At this stage, project partners (all of them with a sound background in the field of quality assurance in HEIs) were asked to identify 4 or 5 key documents, discussing which indicators are more appropriate for quality assurance purposes. These documents could be either scientific articles, project and/or institutional reports, books and other scholarly publications. There were no further requirements in order to select the documents, causing great richness in the collection process, opening up the floor for a wide variety of perspectives.

After several rounds of discussion, a total of 39 unique valid documents were finally selected and analyzed. More than half of these documents were scientific peer-reviewed articles (58%), and most of them analyzed HEIs. Yet, it should be noted that we also included

some articles that target schools instead of HEIs (e.g. Santaolalla *et al.*, 2017) as they highly contributed to the debate on QMS at education centers. As for the publication date, 46% of the documents were published either in 2018 or later, 28% were published between 2011 and 2017 and the remaining 26% were published before 2011. Altogether, these documents provided up to 302 indicators.

These indicators were also classified in the three categories according to its scope: 46% of them referred to the "teaching and learning" mission, 25% belonged to "research" and 14% were included in the "relations with society" dimensions. The remaining 15% referred to indicators that could be considered in more than one category at the same time. As for the decision-making level attained, 13% of the indicators were classified as strategic, 36% were labeled as tactical, 20% refer to the operational level and 31% of them were combinations of the previous ones, fitting in more than one category. Concerning their character, 75% of the indicators gathered at this stage were classified as quantitative.

4.3 Aggregation and harmonization of the indicators

Bringing together the indicators obtained in the two previous stages, we obtained a final sample of 525 indicators, which constituted the initial input for the design of the SMART-QUAL dashboard. Next, we embarked on several rounds for prioritizing, deleting duplicates, grouping and harmonization the set of indicators. A first list of 94 groups was established in order to classify the indicators. An iterative process was then followed, looking for redundancies and aiming at simplicity. We moved from 94 groups into 15 standards. At this point, some close indicators in terms of content, or very high overlapped, were discarded. Other indicators that did not fit in any standard were also dropped.

After some internal discussion, the first version of the instrument was agreed. It encompassed a total of 56 indicators, which were split into two categories: 27 that were considered "basic" and therefore must be in the instrument, and the remaining 29 that could be neglected if necessary for any reason. They were labeled as "recommended". Although useful, this initial structure of the instrument suffered from certain limitations. The number of standards for each module was unbalanced: 10 standards for the teaching dimension, 2 for research and 3 for relation to society. The unequal number of standards in each mission module was a result of a previous decision: following the same standards adopted by the 2015 version of the ESG. Given that one of the initial requirements was that SMART-QUAL should meet the European guide for quality assurance in HEIs, we could not reduce the 10 standards for "teaching and learning". Therefore, 38 indicators were allocated to "teaching and learning", 10 for "research" and 8 for "relations with society".

An internal debate arose among the project partners in order to establish which would be the optimal number of indicators for each standard, and whether the "basic" or "recommended" categories were appropriate for each indicator. It was also discussed which would be the appropriate labels for the standards. For instance, the two "research" standards were named "inputs" and "outputs", and after a careful reading of the indicators, they were changed to "resources" and "results and impact". These new labels better reflect the content of the standards and meet the typology criterion followed in other mission modules.

At this point, it was important to bear in mind that the instrument should meet some requirements in order to be adequate to its original purpose. First, it should be comprehensive, assessing all relevant dimensions within each mission module, which translates into saying that all standards that should be considered were present in the instrument. Second, for the sake of simplicity, the instrument should only contain key indicators, deleting any redundancies or irrelevant ones. Third, all indicators included in each standard should provide reliable information related to the standard.

A two-day meeting was held in Barcelona (October 2021) in which fifteen of the co-authors participated, and the remaining ones were connected remotely to further discuss the final

version. In this session, all the selected indicators were analyzed and redefined one more time, providing its exact formulation and the mathematical procedure in order to be computed. Before this meeting, a total of 26 "concerns" and proposals to modify the instrument were received. All were analyzed in advance and discussed during the meeting.

The final structure of the instrument is summarized in Table 1. In its basic version, the instrument contains 27 items, while in its extended version there are 56 indicators. The complete list of indicators, alongside with their definitions, computation and other basic characteristics, is shown in Annex 1. In addition, Annex 2 shows a summary of the SMART-QUAL indicators set, providing a global overview.

4.4 Validation of the dashboard

Finally, in order to validate the instrument, a last stage was performed between June and August of 2022. A survey was designed to assess the usefulness of the instrument and correct any potential mistakes or omissions. The intended purpose of this survey was explicitly not to obtain in-depth suggestions for immediate improvement. Instead, the primary objective was to ascertain to which extent the instrument can be considered a valuable contribution to the field of quality assurance in European HEIs.

Each partner of the project was requested to contact quality assurance staff in relevant organizations and job positions. An online survey was created, and respondents were asked to reply to it anonymously, although they had to indicate to which group they belong to (strategic vs operational). A total of 28 surveys were fully completed, coming from respondents located in five European countries (Portugal, Spain, Lithuania, Belgium and Italy). In all, 39.3% of the respondents were in a managerial position versus 60.7% of the participants that held an operational position.

Mission/ESG	Name ESG/Standard	Basic	Recommended	Total
Teaching and Learning		*19*	*19*	*38*
1	Policy for quality assurance	3	–	3
2	Design and approval of programs	1	1	2
3	Student-centered learning, teaching and assessment	2	5	7
4	Student admission, progression, recognition and certification	3	4	7
5	Teaching staff	2	5	7
6	Learning resources and student support	2	2	4
7	Information management	1	–	1
8	Public information	1	–	1
9	Ongoing monitoring and periodic review of programs	3	1	4
10	Cyclical external quality assurance	1	1	2
Research		*5*	*5*	*10*
11	Resources	2	3	5
12	Results and impact	3	2	5
Relations with Society		*4*	*6*	*8*
13	Recruitment and social inclusion	1	2	3
14	Collaboration with stakeholders	1	2	3
15	Impact in society	1	1	2
TOTAL		27	29	56

Note(s): For each standard, the number of basic and recommended items is shown

The survey contained a set of questions inquiring about the useful of the indicators, whether the list was complete, if they miss some relevant information, the likelihood of implementing the instrument in their institution and so forth. Each question was evaluated in a 1–7 Likert scale, 1 being the poorest score and 7 the maximum and most positive value. All items scored on average 5.7 or higher. The SMART-QUAL dashboard was thus found to be useful. Respondents also concurred in that the instrument provided a complete view on the HEIs performance in the three missions, that items were clear and that the content was relevant. Respondents did not show any concern about additional dimensions to be included, or items that should be removed.

Only a couple of respondents showed some concern about the number of items included in the first dimension compared to the other ones; however, they acknowledged that this is due to the high number of standards in the first dimensions, and this is something out of the scope as the requirement was to be aligned with the ESG standards. Thus, although the instrument might be biased toward the first mission, it is more inclusive than the existing frameworks as it does not neglect the relevance of the other dimensions.

5. Discussion
The SMART-QUAL instrument aims at supporting HEIs in the implementation of an effective internal quality and assurance system by designing a set of quality indicators to be implemented. The instrument also aims at improving the internal quality system itself (making it more efficient and effective). At the same time, the instrument enhances the alignment of the used indicators in a structured catalogue according to the three main levels of decision-making (strategic, tactical and operational). We expect this instrument to be a reference framework for quality assurance processes. This tool widens the scope of traditional QMS, by including the three main university missions—namely, teaching and learning, research and relations with society—and by defining operative quality indicators for each one. Additionally, it can be used by HEIs for self-evaluation, external evaluation and/or benchmarking exercises, allowing engaged institutions to monitor their quality as a whole and the quality of their processes.

The stakeholders who can benefit from this tool include management boards, administrative staff, professors, researchers of HEIs and quality agencies. Furthermore, the instrument targets other stakeholders involved in the quality management systems and final beneficiary groups such as the students, as they will benefit from a more efficient QM system that will impact their education and the societies these HEIs interact with.

The dashboard presented here is one of the key outputs of the SMART-QUAL project. It should be noted that the indicators included in the instrument not only meet the inclusion criteria defined in section 3, but also have been defined taking into account the SMART principles:

(1) **S**hort: indicators are focused on the efficiency and effectiveness of IQAS and avoid oversizing the instrument.

(2) **M**eaningful: indicators have been found to be useful for the stakeholder – mainly IQAS from HEIs, but also quality agencies and the higher education community – and respond to their needs.

(3) **A**ppropriate: indicators meet the common and shared quality standards, that in a European context it is specified in the ESG supported by ENQA.

(4) **R**eunified: the instrument includes a harmonized set of indicators which have been compiled following good practices already in use.

(5) **T**ransversal: the instrument is flexible enough to suit different countries, contexts and types of HEIs.

Up to 11% of the indicators are qualitative indicators, introducing evidence not specifically quantifiable. The indicator set is also balanced in terms of the main decision-making usage: 31% strategic, 39% tactical and 30% operational. However, the instrument shows a misbalance in terms of the number of standards and number of items for each mission. This is partially due to the intention to keep the whole set of ESGs standards, which are addressed to the first mission.

We are confident in saying that SMART-QUAL is broad enough to include most of the items recommended by either QA staff and existing literature. For instance, the SMART-QUAL dashboard covers the vast majority of the items highlighted by Palomares-Montero and García-Aracil (2011) in their review, except those that are specific to the local setting of their study (e.g. "Number of *sexenios* granted", which is a measurement of research productivity that is only used in Spain). Also, Sánchez-Barrioluengo (2014) analyzed the Spanish system and proposed a set of 22 items across the three missions. Again, there is a significant overlap between their model and our instrument. Marhl and Pausits (2011) used 54 indicators; yet, their analysis was focused only on the third mission. They distinguished three dimensions: (1) continuing education, (2) technology transfer and innovation and (3) social engagement. After a detailed analysis, we concluded that the 54 items they used were measuring aspects that also referred to the first or the second missions, which are also considered in our instrument. Therefore, we can conclude that the instrument is not only useful for QA practitioners but is also aligned with the academic literature.

6. Concluding remarks

The SMART-QUAL dashboard is a grounded, multidimensional and applied instrument for HEIs as a framework for designing and improving their QMS. This scoreboard fills one of the main gaps of the European Higher Education Area: a lack of a comprehensive proposal of harmonized quality indicators. It cannot be neglected that other interesting explorations (Loukkola *et al.*, 2020; The Danish Accreditation Institution, 2019) and initiatives have been previously developed, which have settled the background for the design of the SMART-QUAL dashboard.

It is believed that the SMART-QUAL dashboard has some strength that makes it innovative. First, it takes an international-harmonized point of view, proposing comparable quality indicators among countries or regions and identifying similar indicators and approaches rather than a compendium. Second, it is based on actual good practices identified in HEIs and specialized literature. Third, it considers HEIs' all three missions (teaching and learning, research and relationship with society); therefore, it proposes a wide perspective of higher education quality. Fourth, it is a simplified instrument, in the sense that the number of indicators is relatively less compared to the large amount of indicators that usually HEIs need to collect for auditing and accreditation purposes (internal and external).

It should be noted that the current efforts of HEIs to implement internal QMS based on common criteria and indicators is not sufficiently recognized, due to the lack of a shared framework for quality indicators. The instrument presented here is expected to help HEIs and quality assurance agencies to improve and assess their QMS and boost their development over time. A tool like this one has the potential to keep strengthening the EHEA.

For HEI managers, the SMART_QUAL dashboard stands as a reliable instrument that can be used for two different purposes: to mobilize performance evolution in the three mission perspectives and assess the effects of decisions; and for benchmarking purposes, to the extent that this model can be diffused among HEIs. All HEIs will potentially benefit from both uses, due to the fact that the information required to compute the indicators is available and easy to collect.

Next steps in the SMART-QUAL project include the writing of a guideline for the implementation of the instrument and a pilot stage to test its implementation. In both actions,

it will be required to keep all stakeholders involved, as we have done to date, in order to make this a useful tool for HEIs.

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Annex 1

Name	Description	Formula	Basic/ Recommended	Decision level
Teaching and learning				
1 Policy for quality assurance				
Fulfillment of objectives	Percentage of strategic planning objectives fulfilled	(Σ Strategic plan objectives fulfilled/Σ Strategic plan objectives) *100	Basic	Strategic
QA procedures definition	Application of procedures for internal quality assurance	NA	Basic	Strategic
QA results and impact	Percentage of improvement actions performed	(Σ Improvement actions performed/Σ Improvement actions planned) *100	Basic	Operational
2 Design and approval of programs				
Design of programs	Appropriateness of intended learning outcomes, teaching and assessment methods	NA	Basic	Operational
Programs offer	Percentage of second and third cycle programs	(Σ Second and third cycle programs offered/Σ Programs offered) *100	Recommended	Strategic
3 Student-centered learning, teaching and assessment				
Student engagement	The design of programs promotes the student as a co-producer of his/her training	NA	Basic	Operational
Teacher-student balance	Ratio of students to FTE teaching staff	Σ Students/Σ FTE teaching staff	Basic	Tactical
Academic staff workload	Ratio of teaching hours offered per FTE teaching staff	Σ Teaching hours delivered/Σ FTE teaching staff	Recommended	Tactical
Assessment system	Teaching staff peer evaluation of assessment/ examination protocols	NA	Recommended	Operational
Efficiency rate	Ratio between credit units required for graduation and credit units actually enrolled since first year on program	(Σ Credit units required for graduation/Σ Credit units enrolled from first year until graduation) *100	Recommended	Operational
Student mobility	Ratio of international agreements that have incoming or outgoing mobility per programs offered	Σ International agreements that have incoming or outgoing mobility/Σ Programs offered	Recommended	Strategic
Time to degree completion	Average duration of study pathway	Average time until degree competition	Recommended	Tactical

Table A1.
SMART-QUAL quality
indicators scoreboards

Name	Description	Formula	Basic/ Recommended	Decision level
4 Student admission, progression, recognition and certification				
Dropout rate	Percentage of students dropping out from a program	(Σ Students not enrolled or graduated in a year (t)/Σ Students enrolled in a previous year (t-1)) *100	Basic	Operational
Graduation rate in specified time	Percentage of students completing the study program within expected number of years	(Σ Graduates who completed the program within the expected time established by curriculum/Σ Graduates) *100	Basic	Tactical
Progress rate	Percentage of passed credit units	(Σ Passed credit units/Σ Assessed credit units) *100	Basic	Operational
Student academic results	Average of the final qualifications of graduates	Σ Final qualification of graduates/Σ Graduates	Recommended	Tactical
Student enrollment in postgraduation	Ratio of PhD students per students enrolled	Σ PhD students/Σ Students enrolled	Recommended	Tactical
Student profile	Sexual and socioeconomic diversity	NA	Recommended	Strategic
Student's placement by first choice	Demand coverage index	(Σ Candidates in 1st option or equivalent)/(Σ Vacancies) *100	Recommended	Operational
5 Teaching staff				
Teaching staff holding a PhD	Percentage of FTE teaching staff holding a PhD per all FTE teaching staff	(Σ FTE teaching staff holding a PhD)/(Σ FTE teaching staff) *100	Basic	Tactical
Training of teaching staff	Percentage of FTE teaching staff who participated in activities to improve their teaching skills per FTE teaching staff	(Σ FTE teaching staff who participated in activities to improve their teaching skills/Σ FTE teaching staff) *100	Basic	Operational
International staff	Percentage of international visiting teaching staff	(Σ International visiting teaching staff/Σ FTE teaching staff) *100	Recommended	Strategic
Student satisfaction with teaching staff	Average satisfaction with quality of teaching staff, teaching quality and teaching staff engagement	Average valuation of quality of teaching staff, teaching quality and teaching staff engagement	Recommended	Tactical
Teacher–non-academic staff balance	Ratio of FTE teaching staff to FTE non-academic staff	(Σ FTE teaching staff)/(Σ FTE non-academic staff)	Recommended	Tactical
Teaching staff mobility	Percentage of teaching staff joining the ERASMUS program	(Σ FTE teaching staff joining ERASMUS program)/(Σ FTE teaching staff) *100	Recommended	Operational

Table A1.

(*continued*)

Name	Description	Formula	Basic/ Recommended	Decision level
Teaching staff profile	Percentage of teaching staff in each professional category	(Σ FTE teaching staff by professional category)/(Σ FTE teaching staff) *100	Recommended	Operational
6 Learning resources and student support				
Facilities	Percentage of classroom hours offered compared to the total need	(Σ Total number of hours required)/(Σ Number of hours available) *100	Basic	Operational
Library services	Ratio of library resources per FTE student	Σ Library resources/Σ FTE students enrolled	Basic	Tactical
Student satisfaction with facilities	Average satisfaction with facilities and other resources	Average valuation of facilities and other resources	Recommended	Operational
Teaching and learning expenditure	Percentage of expenditure dedicated to teaching and learning activities	(Σ Expenditure on teaching and learning)/ (Σ Total institutional expenditure (by the HEI)) *100	Recommended	Tactical
7 Information management				
QA data collection system	Application of a system for data collection in different processes	NA	Basic	Tactical
8 Public information				
Public information	Percentage of degree programs with public information about quality	(Σ Current degree programs with public information about quality/Σ Current degree programs) *100	Basic	Strategic
9 Ongoing monitoring and periodic review of programs				
Graduate employment rate	Percentage of graduates employed	(Σ Graduates working/ Σ Graduates) *100	Basic	Tactical
Overall student or graduate satisfaction	Average valuation of overall quality of the courses offered	Average valuation of overall satisfaction with courses offered	Basic	Operational
Student satisfaction with teaching and learning	Average satisfaction with the organization of course sessions	Average valuation of the organization of course sessions	Basic	Tactical
Graduate employment in related job	Percentage of graduates employed in a job related to the study program	(Σ Graduates working in job related to study program/Σ Graduates) *100	Recommended	Operational

(*continued*)

Table A1.

Name	Description	Formula	Basic/ Recommended	Decision level
10 Cyclical external quality assurance				
Compulsory accreditation of programs	Percentage of programs fully accredited through compulsory accreditation	(Σ programs fully accredited through compulsory accreditation)/(Σ Programs assessed through compulsory accreditation) *100	Basic	Strategic
Voluntary accreditation of programs	Percentage of programs fully accredited through voluntary accreditation	(Σ Programs fully accredited through voluntary accreditation)/(Σ Programs assessed through voluntary accreditation) *100	Recommended	Strategic
Research				
11 Resources				
Research funding	Ratio of revenue raised for research per FTE teaching staff	Σ Revenue raised for research/Σ FTE teaching staff	Basic	Strategic
Research projects	Percentage of approved competitive projects	(Σ Projects approved/Σ Project applications) *100	Basic	Strategic
Academic inbreeding	Percentage of academic staff recruited who have not obtained a PhD at the same university	(Σ Academic staff recruited who have not obtained a PhD at the same university)/(Σ Total academic staff recruited) *100	Recommended	Strategic
Members in research units	Percentage of teaching staff integrated in research units	(Σ FTE teaching staff holding a PhD integrated in research units)/(Σ FTE teaching staff) *100	Recommended	Strategic
Research engagement	Research effort index per FTE teaching staff	Σ Proportion of time devoted to research by teaching staff/Σ FTE teaching staff	Recommended	Tactical
12 Results and impact				
Intellectual property dimension	Ratio of revenue from royalties and license agreements per FTE teaching staff	Σ Royalty revenues and licensing agreements for intellectual property of HEI over the past 3 years/Σ Number of FTE teaching staff at HEI over the past 3 years	Basic	Tactical

Table A1.

(*continued*)

Name	Description	Formula	Basic/ Recommended	Decision level
Research citations	Ratio of impact scientific production per FTE lecturer	Σ Citations of indexed articles in SCOPUS where at least one author is affiliated to the institution/Σ FTE teaching staff	Basic	Tactical
Research publications indexed	Percentage of articles published in first-quartile journals in the scientific area per total number of articles published in year n in that area	(Σ Articles published in 1st-quartile journals in the scientific area in year n/Σ Total articles published by HEI staff in year n in that scientific area) *100	Basic	Tactical
Patents	Ratio of patent grants registered by at least one member from the HEI per FTE teaching staff	Σ Patent grants registered by at least one member of the HEI/ Σ FTE teaching staff	Recommended	Tactical
Research grants	Ratio of ongoing scientific research grants per FTE teaching staff	Σ Ongoing scientific research grants/Σ FTE teaching staff	Recommended	Tactical

Relationship with society

13 Recruitment and social inclusion

Name	Description	Formula	Basic/ Recommended	Decision level
Recruitment of international students	Percentage of international students enrolled	(Σ International students enrolled/Σ Students enrolled) *100	Basic	Strategic
Financial aid to students	Percentage of students who receive a scholarship based on social background	(Σ Students receiving scholarship based on social background/Σ Students enrolled) *100	Recommended	Strategic
Life-long learning	Ratio of participants in lifelong learning programs per students enrolled	Σ Participants in lifelong learning programs/Σ Students enrolled	Recommended	Operational

14 Collaboration with stakeholders

Name	Description	Formula	Basic/ Recommended	Decision level
Research partnerships	Ratio of cooperation agreements for research and transfer with third-parties per FTE teaching staff	Σ Cooperation agreements for research and transfer with third-parties/Σ FTE teaching staff	Basic	Strategic
Collaboration with stakeholders	Ratio of protocols/ agreements established with external organizations per FTE teaching staff	Σ Protocols or agreements established with external organizations/Σ FTE teaching staff	Recommended	Strategic
Students industry link	Ratio of students involved in external organizations per students enrolled	Σ Students involved in internships, projects, or dissertations conducted at external organizations/Σ Students enrolled	Recommended	Strategic

(continued)

Table A1.

Name	Description	Formula	Basic/ Recommended	Decision level
15 Impact in society				
Spin-offs	Ratio of spin-offs established per FTE teaching staff	Σ Spin-offs established/ Σ FTE teaching staff	Basic	Tactical
Sustainability	Ratio of sustainable actions for environmental and social matters per students enrolled	Σ Sustainable actions/Σ Students enrolled	Recommended	Strategical

Table A1.

Note(s): Items are arranged in the three mission groups and the fifteen standards

Annex 2

	Name ESG/standard	Basic	Recommended
	Teaching and Learning		
1	Policy for quality assurance	• Fulfillment of objectives • QA procedures definition • QA results and impact	-
2	Design and approval of programs	• Design of programs	• Programs offer
3	Student-centered learning, teaching and assessment	• Student engagement • Teacher–student balance	• Academic staff workload • Assessment system • Efficiency rate • Student mobility • Time to degree completion
4	Student admission, progression, recognition and certification	• Dropout rate • Graduation rate in specified time • Progress rate	• Student academic results • Student enrollment in postgrad • Student profile • Student's placement by first choice
5	Teaching staff	• Teaching staff holding a PhD • Training of teaching staff	• International staff • Student satisfaction with teaching staff • Teacher – non-academic staff balance • Teaching staff mobility • Teaching staff profile
6	Learning resources and student support	• Facilities • Library services	• Student satisfaction with facilities • Teaching and learning expenditure
7	Information management	• QA data collection system	-
8	Public information	• Public information	-

Table A2.
Summary of SMART-QUAL indicators set

(*continued*)

	Name ESG/standard	Basic	Recommended
9	Ongoing monitoring and periodic review of programs	• Graduate employment rate • Overall student or graduate satisfaction • Student satisfaction with teaching and learning	• Graduate employment in related job
10	Cyclical external quality assurance	• Compulsory accreditation of programs	• Voluntary accreditation of programs
Research			
11	Resources	• Research funding • Research projects	• Academic inbreeding • Members in research units • Research engagement
12	Results and impact	• Intellectual property dimension • Research citations • Research publications indexed	• Patents • Research grants
Relationship with society			
13	Recruitment and social engagement	• Recruitment of international students	• Financial aid to students • Lifelong learning
14	Collaboration with stakeholders	• Research partnerships	• Collaboration with stakeholders • Students industry link
15	Impact in society	• Spin-offs	• Sustainability

Table A2.

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