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

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(Article begins on next page)

19 November 2026

**Title:**

SMART-QUAL: A Dashboard for Quality Measurement in Higher Education Institutions


**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, it was analyzed the information disclosed in official websites or institutional documentation of 36 selected HEIs. It was complemented with 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 other 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 its turn classified into the 3 HEI missions. It is also proposed a basic model and the extended model.

Originality:

The paper provides a useful measure of quality performance of HEIs, showing a holistic view to monitor HEIs 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.



**Key words:**

Quality performance; Higher Education Institutions; Dashboard; Quality assurance.

**Funding details**

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## 1.- INTRODUCTION

Higher education quality management systems (QMS) are 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 tend to rely on a large quantity of quality indicators, which makes their accuracy and timely analysis difficult, and consequently undermine their adequate use for decision-making at different levels (strategic, tactical, or operational).

Additionally, most existing QMS focus on the first Higher Education Institutions (HEI) mission, neglecting the second and third ones. HEIs are expected to excel at three different mission. First in "teaching and learning", which was the first mission assigned to HEI. The second one is "research", which refers mainly to knowledge creation. The last one considered is the "relation with the society", that in some papers is only termed as "transfer" or knowledge transfer, that encompasses other types of activities more socially and cultural driven. The three topics are relevant and important, and at the same time interconnected. Some HEI might highlight only one of them, but any excellent HEI cannot neglect any dimension (Marimon, Mas-Machuca, & Berbegal-Mirabent, 2019; Hossain, Hossain & Chowdhury, 2018). Moreover, the commercial competition imposed by economic forces, have forced universities to focus on the quality of service as a way to obtain sustainable competitive advantages (Abdullah, 2006; Sadiq Sohail & 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. Although 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 HEI in the European Higher Education Area adhere to the same set of principles and that the processes and procedures implemented are modelled 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 HEI and the institutional agencies for quality on the use of these ten standards. What is not so clear is how to measure each of these standards. Additionally, these standards suffer from an important limitation: they only cover the dimension "teaching and learning". Nowadays, it is admitted that HEI have an important role in the research development and in transforming the society through "transferring" actions.

Once the context is settled, authors of this paper are currently conducting a project funded by the European Commission, through an Erasmus+ Project, aimed to propose a reliable instrument, consisting in a Quality Indicators System (QIS), to assess and monitor quality in HEI. It is named SMART-QUAL, and addresses some existing important needs:

- Lack of a comprehensive framework of harmonized quality indicators and benchmarks.
- Lack of internal QMS evaluation process by quality assurance agencies, based on common criteria and indicators, which translates in efforts of HEIs to implement internal QM systems not being officially recognized.

Therefore, the main objective of the SMART-QUAL project is to define an instrument to assess the quality of HEIs, consisting in of set of harmonized quality indicators at European level to measure, monitor and assess HEI main processes (learning and teaching; research; and relations with the society). Therefore, a set of indicators will be proposed. Indicators will be arranged in three main dimensions, according to the main roles that are tacitly or explicitly expressed in the mission of any HEI. The quality indicators to be designed are meant to be applied by the

institutions within their QMS and, as such, contribute to improve in the short and long term these systems (making them more efficient and effective).

The indicators will be presented according to the main institutional processes they refer to ("teaching and learning", "research", and "relations with society"), and will be classified in "strategic", "tactical", and "operational", in line with the decision-making level they address. It is intended that the set of indicators cover the ESG standards 2015 (ENQUA, 2015), but not be reduced to it.

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.- STATE OF THE ART AND STRUCTURE OF THE INSTRUMENT

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 European Higher Education Area (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 were 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 were 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 European Higher Education Area (EHEA) when implementing their quality management systems (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 modelled 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, Sarrico, & Rosa, (2017a) this practice seems to be growing, since the usual mechanism of periodically accrediting or evaluating study programmes "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 that 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 (2005), 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 scholarship 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 responsible also for other missions. It is traditionally recognized that the two main missions of universities are teaching and research (Marhl and Pausits, 2011). However, the third mission is often neglected when assessing the performance of universities. Marhl and Pausits, (2011) states that this society transformation embraces several topics. Hence, in this century, there is a particular attention to 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: both were published in the same year. Other important issues are related to the any kind of inequality. This is neither embedded in the original set of ESG.

As such, aligning a QMS with the ESG leads to a QMS too narrow in its scope, without a sufficient level of integration of the institution's main processes. This is contrary to the idea vehiculated by the European University Association (2010) when 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 yet not as developed as it would be desirable. On one hand, 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 tend 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 a with special focus on teaching and learning; and appraisal systems for academic and non-academic staff). Also, the information support systems 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 programmes 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 this data in order to enable taking right decisions, at the different government levels.

Quality indicators are indeed paramount to monitor, assure 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: 77), that indicators are "concepts that represent qualitative and quantitative information and data, which indicate functional qualities (…) of institutional, organizational or individual performance providers", then 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 QMS need quality indicators, but these indicators need to reflect the different processes occurring within a 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 and researchers 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., 2017) or relation with society (Biscaia et al., 2017; Bruckmann, 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. In this vain, Urdari et al., (2017) analyze types of measurements used by international university rankings and their connection to the higher education institutions' (HEIs) third mission activities, namely, the contribution to

society. They also corroborate that rankings focus on teaching and research activities but rarely measure the HEIs' connection to practice.

The few studies we were able to identify in the literature include the one by (Palomares-Montero & 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 (TTO) managers. Up to 6 indicators were selected as most important to assess teaching (among them, "Results of the teaching survey" and "Ratio PDI to students"). Other 9 were selected for "research" (e.g. "% PDI producing JCR"; "Number of sexenios granted" - the "sexenio" is a recognition of the research accomplished during six years for the quality agency in Spain system). There were also 6 main indicators for "knowledge transfer" (e.g., "Number of spin-offs").

Similarly, Hernandez-Diaz et al. (2020) have 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 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 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. However, they propose additional dimensions such as "Internationalization" and "Extension", that are partially covered in SMART-QUAL.

Sánchez-Barrioluengo (2014) provides a critical reflection on the 'one-size-fits-all' model which conceptualizes universities as centers of excellence in education, research and third mission. They provide a set of 22 indicators gathered in three dimensions: the three missions. She found a positive correlation between the second and third missions, but a negative one between these two missions and the first mission. It seems that those HEIs that excel in the first mission, are neglecting other missions. Consequently, she raises unrealistic expectations related to the capacity of universities to fulfil all these roles simultaneously.

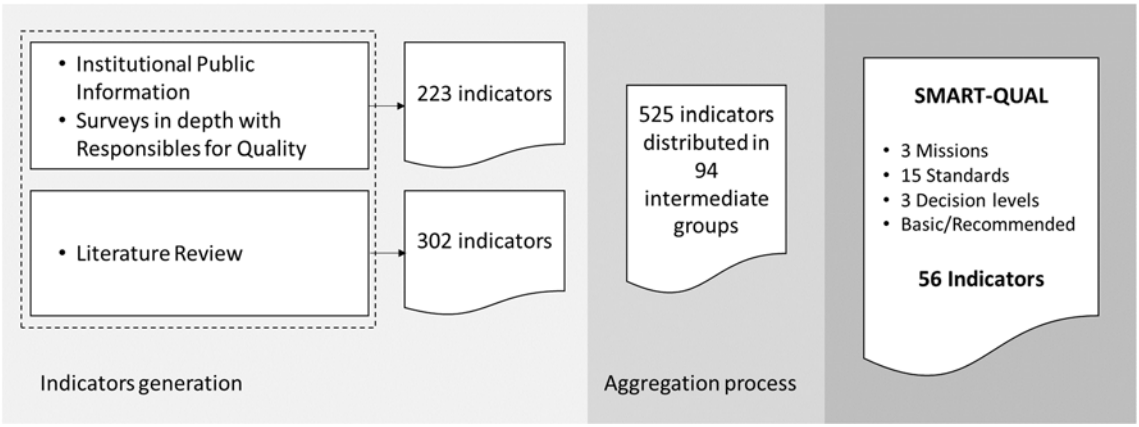
Given the relative absence of studies reporting quality indicators sets covering the three HEIs main processes, as well as their efficient and effective inclusion in integrated QMS, the aim of the SMART-QUAL project has been, from the outset, the development of a quality indicators scoreboard (QIS) covering the three main processes of HEIs, able to sustain decision-making at strategic, tactical and operational levels. Furthermore, and due to the relevance of the ESG for the implementation of QMS in European HEIs, the scoreboard should include quality indicators aligned with the standards of ESG Part 1. This has led to the development of a QIS organized around three modules (teaching and learning, research and relation with society) which include 15 standards (10 for teaching and learning; 2 for research and 3 for relation with society) as explained in the next section of this paper. Additionally, the purpose was to have a QIS emerging not only from literature review, but also from the HEIs since there does not seem to exist many quality indicators' proposals which originate from them. As such, the QIS presented in this paper

results both from a review of the literature and the actual quality indicators implemented by HEI.

## 3.- METHODOLOGY

Churchill (1979) proposed a framework to define measurement scales, particularly useful in our knowledge field, and Rossiter (2011) refreshed it some years later. They recommend beginning with the specification of the domain that is intended. Once the domain is clear, the process to generate items to be included starts. Since the domain is well established in previous sections, this section is devoted to the generation of items and its final assignment to the established modules and standards. Figure 1 shows the complete process that is described in this section.

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




Two main sources were consulted in order to extract indicators: (i) 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 (ii) a large literature review specialized in the topic. After the indicators collection process, a phase to aggregate items from both sources was required.

In order to guide the collection process, it was agreed by authors that the instrument should assess diverse dimensions that all HEI have embedded in its mission at different levels. This instrument can also be referred to as a Dashboard, or as a Quality Indicators Scoreboard. The main dimensions that will be covered are (i) "teaching and learning", which measures processes around knowledge transfer and development of competences in students, (ii) "research", which deals with all processes around knowledge generation and dissemination and (iii) "relations with society", that refers to all processes around the impact to society, economy, environment, or the engagement of stakeholders.

The instrument also will be so flexible to be used by managers at different levels in the HEI organization. The indicators will be aligned in a structured catalogue according to the three main aforementioned levels of decision making (strategic, tactical, and operational).

Some additional considerations were also taken into account regarding the indicators. These criteria set is listed without any importance prioritization. First, these indicators should have a

correct and clear time reference. Second, the indicators should differentiate the three cycles of higher education. Third, 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. Fourth, sociodemographic characteristics must also be analyzed and included in the instrument. Gender analysis is taking a high relevance in policymaking. Also ethnicity, maturity, or social background are other important inequality dimensions in Higher Education. Fifth, standardization. It means that indicators should use comparable criteria in order to enable comparison between different contexts (units, years, regions, countries…).

Once the collection of items was set, next was extracting the most relevant and representative in order to be selected for the final Smart-Qual. Following subsections are devoted to each methodology step.

Next two subsections are devoted to explain to process to extract items form these two sources: the managers of HEI that are in quality management positions in their institutions, and the literature that analyzes quality management and quality assurance in this sector. In this way we nourished the final dashboard from the practitioner view and also from the academic.

### 3.1. Quality Management items used in HEI.

First, it was analyzed the current situation of QMS in 36 HEIs spread over 5 European countries (Portugal, Spain, Belgium, Lithuania and Italy), with particular emphasis being given to the quality indicators used in these systems. A template was designed to frame the data collection. This work included desk research (analysis of different institutional documents, such as quality manuals, strategic plans and activities plans, as well as the institutions' websites), combined with formal and informal contacts with the institutions included in the sample.

The sample was made of 21 universities, 4 polytechnic institutes, 2 universities of applied sciences, 7 schools and 2 colleges. While 27 are public HEIs, 9 are private ones. Regarding their size, the sample comprises rather small institutions, with less than 5,000 students (12 HEIs), medium sized ones, with a number of students ranging from 5,000 to 15,000 (12HEIs), as well as large institutions, with a number of students that goes well beyond the 20,000 students (12 HEIs). 12 of the institutions have only one campus, while 24 of them are located at multi campuses. Furthermore, most of the HEIs are comprehensive (24) with only 8 having a specific character. Finally, while 20 are located in metropolitan cities (Milan, Barcelona, Lisbon, Vilnius and Brussels), 16 are placed in regional cities.

The reasons for the selection of these institutions/QMS 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 easiness 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 address 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. 13 institutions refer 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 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 3 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 that doesn't have this certification, has its QMS certified according to the ISO 9001:2015 standard. In the Lithuanian case the assessment of the QMS is part of the institutional or study programs evaluation/accreditation; as such, although the QMS have not been formally certified, they have been externally reviewed. As for the Spanish institutions, the situation is somewhat more diverse, but the same rationale applies: 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, but rather a self-developed model based on key performance indicators for several dimensions.

Finally, it was decided the profile of the experts to be interviewed. For the purpose of this project, we will classify stakeholders in three groups:

1. Strategic: Top managers responsible for internal quality assurance systems (e.g., vice-rector for quality)
2. Operational: Person responsible for execution of the quality assurance system (e.g., the Internal Quality Assurance Office)
3. Secondary: People that do not take part in the decision-making process nor in the daily management of the QIS, but are affected by the system and the regulation, which in turn, might benefit from a more efficient and meaningful QM system (e.g., administrative staff, students, alumni, academics, employers, etc.)

Given that this intellectual output aims at defining a protocol on how to implement the QIS, only stakeholders in groups (1) and (2) were contacted at this point. 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. 26 of these experts had more than 5 years' experience in quality management. Five of them more than 20 years.

It was also agreed the protocol for these interviews. Their answers were stored in a database structured in a way that enabled the analysis. It allowed to define a set of characteristics for the instrument according to their practitioner experience (e.g., easiness to collect data; usefulness for benchmarking purpose, easiness to update, focused on continuous improvement, etc...). These interviews added some indicators or items to those that had been captured from the official documentation disclosed by HEI through different channels. Overall, 223 quality indicators were identified in the 36 QMS analyzed. The main characteristics of these quality indicators can be summarized as follows:

- 201 are quantitative indicators, while 22 are qualitative indicators.
- According to the HEI mission covered, most indicators covers only one (208). Out of these 208, 85 are addressing to "teaching & learning", 63 to "research" and 60 to "relation with society". The remain indicators are pursuing more than one mission
- According to the decision-making level, 117 are at strategic level, 31 at tactical level and 30 at operational. The remain are useful at two or more mission levels at the same time.

### 3.2. Quality Management items extracted from the literature.

The second main source to feed the instrument was relevant literature on Quality Indicators for QMS, and particularly in the HEI setting. All authors contributed proposing documents according to their knowledge. There were no particular requirements or indications in order to select documentation. This caused a great richness in the collection process, due to the fact that each author could contribute with the best documents according to his/her experience. Some valuable documents were included that a more constraint selection policy would had not allow. On the other hand, this lack of criteria selection brings that documents with different impact are considered with the same importance.

Up to 39 unique and valid resources have been analyzed, which are of different types: scientific articles, project and institutional reports, books and other scholar publications and management documents. These documents provided up to 302 indicators. The publication of the selected documentation was recent (46% published in 2918 and afterwards), whereas 26% were published before 2011. Most of these documents were scientific articles peer reviewed (58%). Among these articles, most of them were analyzing HEIs. However, some articles that analyze schools instead of HEIs (e.g., Santaolalla et al., 2017) can also contribute in this debate.

These indicators were also classified in the three categories according to its scope: 46 % were on "Teaching & Learning", 25 % on "Research" and 14 % on "Relations with Society". The remaining 15% were documents combining two categories or the three of them at the same time. According to the decision making level attained, 13% were strategic, 36 % tactical, 20 % operational and 31 % were combinations of the previous levels.

### 3.3. Aggregation and harmonization of indicators.

From both sources, a corpus of more than 500 Quality Indicators was compiled and became the initial input for SMART-QUAL creation. The authors expertise was key for grouping, prioritization, and harmonization of the set of collected Quality Indicators. A list of 94 groups or labels were set in order to distribute the indicators. An iterative process in which all individual assignation of each author were merged. Next step was assigning these 94 groups into the 15

standards previously agreed. 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. Other indicators that did not fulfill the requirements agreed also were discarded.

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 termed as "recommended".

At first glance, the structure of the instrument suffered from certain limitations. The number of standards for each module was unbalanced: 10 standards for the first module, 2 for the second and 3 for the last. 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. It was agreed from the beginning that SMART-QUAL should meet the European guide for quality assurance in HEIs. Therefore, the 10 standards for "teaching and learning" were settled from the beginning without further discussion. Therefore, 38 indicators were allocated to "teaching and learning", 10 for "research" and 8 for "relations with society".

An internal debate arose among authors in order to establish which would be the optimal number of indicators for each standard, and on some migration of indicators form "basic" to" recommended" or vice versa, etc. It was also discussed which would be the appropriate labels for standards and which should be the appropriate labels for 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 express better the content of the standards, and meet the typology criterion followed in other mission modules.

At this moment, authors kept in mind that the instrument should meet some requirements in order to be adequate to the original purpose. It should be complete, assessing all the relevant dimension within each mission module. It means that all standards that should be considered are present in the instrument. At the same time, for the sake of simplicity, any not strict needed should be included. Additionally, all indicators compressed in each standard should provide valid information related to the standard.

All this was tackled in a two days meeting in which fifteen coauthors were present in Barcelona (October 2021), and the remaining authors were on remote. In this session, all the selected indicators were again analyzed and redefined, 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, accepting directly some of them or discarding those that were not relevant or out of scope. The remaining 11 were fully discussed in Barcelona. The final structure of the instrument is summarized in Table 1. Although the complete instrument is composed of 56 items, all items are categorized as "basic" or "recommended". In this way, the basic model is only composed by 27 items, which makes the instrument easy to implement. The complete list of indicators, alongside with its definition, computation and other basic characteristics are in the Annex 1.

Table 1.- SMART-QUAL instrument. For each standard it is shown the number of basic and recommended items.

| Mission/ESG | Name ESG / Standard | Basic | Reco-mmen-ded | Total |
|---|---|---|---|---|
| Teaching & 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 | On-going 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 |

The last stage was performed between June and August of 2022, consisting in a survey to assess the utility of the instrument. A total of 28 respondents from five countries was received, with 39.3% of surveys from participants in a managerial position versus 60.7% from participants in an operational position. The aggregated scores across respondents were very positive. The SMART-QUAL was found useful. It was also agreed that it provides a complete view on the HEIs performance in the three missions, its items are clear and the content relevant.

Some experts showed their concern about the high importance that the instrument pays to the first mission. The number of standards and items of this mission comparing to the others says a lot. The instrument is biased to the first mission, regardless that the criteria for many rankings, or for some calls for projects are more and more based on research.

It is also important in terms of content validity to analyze the what is not included in the instrument. The instrument must measure what is intended to, and might not include what is not intended. Experts did not show concern about additional potential dimensions to include, or about items that should be removed.

## 4.- INSTRUMENT DESCRIPTION

The SMART-QUAL aims to support HEIs in the implementation of an effective internal quality and assurance system, by designing a set of Quality Indicators to be implemented. The instrument aims also to improve the internal quality system itself (make it more efficient and

effective, both in the short and in the long term). 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). The QIS aims at being a reference framework for Quality Assurance processes. This tool widens the range of the scope (including the three main university missions: Teaching & Learning, Research and Relations with Society), and defines operative Quality Indicators for each one, focusing more on outcomes. Additionally, it can be used by each HEI for self-evaluation, external evaluation and/or benchmarking exercises, allowing engaged institutions to monitor their quality as organizations 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 project targets other stakeholders involved in the quality management systems and final beneficiary groups as the students benefiting from a more efficient QM system that will impact their education, and the societies these HEIs interact with.

Therefore, the aim of SMART-QUAL project is far from creating an exhaustive and extensive compilation of all possible Quality Indicators already in use or able for use, but a SMART set that could be defined as follows:

- **S**hort: focused on the efficiency and effectiveness of IQAS and avoiding oversizing.
- **M**eaningful: useful for the stakeholder's needs, mainly IQAS from HEIs, but also Quality Agencies and the Higher Education community.
- **A**ppropriate: meeting the common and shared quality standards, that in an European context it is specified in the ESG supported by ENQA.
- **R**eunified: harmonized set and compilated good practices already in use.
- **T**ransversal: suitable in different countries, contexts, and types of HEIs.

As aforementioned, Annex 1 provides information for the whole instrument, including mathematical operationalization. It shows how indicators are distributed according to different criteria: the three missions, the fifteen standards, the basic/recommended categories, and finally to the three decision level. Annex 2 shows a summary of SMART-QUAL indicators set and allows a global glance of it.

Up to a 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 number of standards and in number of items for each mission. This partially is due to the intention to keep the whole set of ESGs standards, which are addressed to the first mission.

SMART-QUAL is broad enough to include the most of the items recommended in previous literature. Palomares-Montero and García-Aracil (2011) published their analysis based on 40 items classified in the three missions. These items are already included (adapted) in SAMRT-QUAL, 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 used only in Spain). Also Sánchez-Barrioluengo (2014) analyzed the Spanish system. She also considers the three classic missions, using 22 items, which are also included in our instruments. There is a significant overlap in their models.

Marhl and Pausits (2011) use 54 indicators in their analysis focused only on the third mission. They propose a distribution of these items in three dimensions: (i) Continuing Education, (ii)

Technology Transfer & Innovation, and (iii) Social Engagement. However, most of these 54 items are measuring at the same time the first or the second missions. Our instrument collets the main information and content that are proposed by previous literature.

## 5.- CONCLUSIONS, LIMITATIONS AND AGENDA FOR FUTURE RESEARCH

The SMART-QUAL Quality Indicators Scoreboards (QIS) is a grounded, multidimensional and applied instrument for HEIs as a framework for designing and improving their QMS. The QIS addresses one main need for 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 (SQELT Project, 2020; Expert Group on Knowledge Transfer Metrics, 2009) developed previously and are the background on which SMART-QUAL relies.

The SMART-QUAL QIS presents some strengths that makes it innovative:

1. 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.
2. Based on actual good practices identified in HEIs and specialized literature.
3. Consider all three Higher Education missions: Teaching & Learning, Research and Relationship with Society. Therefore, it proposes a wide perspective of Higher Education quality.
4. Simplified instrument: the number of indicators is really short, compared to the big amount of indicators that usually HEIs need to collect for auditing and accreditation purposes (internal and external).

Currently, the 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 of Quality Indicators. SMART-QUAL QIS will help HEIs and Quality Assurance Agencies to improve and assess their QMS and boost their maturation and development. A tool like that has the potential to keep enhancing the European Higher Education Area.

For the HEI managers point of view it provides a reliable instrument that will 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 will be diffused among HEIs. All HEIs will potentially benefit from both implementations, due to the fact that the information required to compute the indicators is available and easy to collect.

Once the instrument is defined further developments will take place, specifically the Guidelines for implementation of the QIS and a testing stage. Both processes, together with the evolution of the EHEA, the Quality perspective and the stakeholders' needs, will necessarily trigger a continuous review and improvement of it in order to keep the SMART-QUAL QIS as a useful tool for HEIs.

REFERENCES


Abdullah, F. (2006). Measuring service quality in higher education: HEdPERF versus SERVPERF. *Marketing Intelligence and Planning*, *24*(1), 31–47. https://doi.org/10.1108/02634500610641543

Bender, K. K., Siller, T. J. (2006). How an engineering college uses a university's quality enhancement system to generate and manage evidence for multiple accreditation and accountability bodies. Quality in Higher Education, 12(2), 175–191

Biscaia, R., Melo, A.I., Machado, I. Figueiredo, H., Rosa, M.J., & Rocha, P. (2020). Performance indicators for research and cultural creation activities in polytechnic higher education institutions: a consensus building approach. Tertiary Education and Management, 26, 281–294. https://doi.org/10.1007/s11233-019-09035-y

Bruckmann, S., Rosa, M.J., Nazaré, L. (2019). Third mission activities in quality assurance systems. Do theory and practice match? Paper presented to the 14th European Quality Assurance Forum - Supporting societal engagement of higher education, TU Berlin, Berlin, Germany, 21-23 November 2019.

Bruni, R., Catalano, G., Daraio, C., Gregori, M., & Moed, H.F. (2020). Studying the heterogeneity of European higher education institutions. Scientometrics, 125, 1117–1144. https://doi.org/10.1007/s11192-020-03717-w

Bucur, A., Kifor, C.V. & Marginean (2018). Evaluation of the quality and quantity of research results in higher education. Quality & Quantity, 52, 101-118. https://doi.org/10.1007/s11135-016-0452-9.

Cardoso, S., Rosa, M.J., Videira, P., Amaral, A. (2017). Internal quality assurance systems: 'tailor made' or 'one size fits all' implementation?, Quality Assurance in Education, Vol. 25, Issue: 3, pp.329-342, https://doi.org/10.1108/QAE-03-2017-0007.

Cardoso, S., Rosa, M.J. (2018). European Policy Implementation: Challenges for Higher Education Quality Assurance. In C. Sin, O. Tavares, S. Cardoso, M.J. Rosa (Eds.) (337-360), European Higher Education and the Internal Market. Tensions between European Policy and National Sovereignty. Cham, Switzerland: Palgrave MacMillan/Springer Nature.

Churchill, G. A. (1979). A Paradigm for Developing Better Measures of Marketing Constructs. *Journal of Marketing Research*, *16*(1), 64–73. https://doi.org/10.2307/3150876

Cruickshank, M. (2003). Total quality management in the higher education sector: A literature review from an international and Australian perspective. Total Quality Management & Business Excellence, 14(10), 1159–1167.

ENQA (2015), Standards and guidelines for quality assurance in the European higher education area (ESG), (Revised ESG approved by the Ministerial Conference in Yerevan on 14-15 May 2015), European Association for Quality Assurance in Higher Education, Yerevan.

EUA (2010). EUA Policy Statement on Quality and Quality Assurance in the European Higher Education Area, European University Association, Brussels.

Gover, A., Loukkola, T., Sursock, A. (2015). ESG Part 1: Are universities ready?, EUA Occasional papers, EUA, Brussels, pp. 1-31.ENQUA. (2015). Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). *Definitions*. https://doi.org/10.32388/z5vv0t

Hernandez-Diaz, P.M., Polanco, J.-A. & Escobar-Sierra, M. (2020). Building a measurement system of higher education performance: evidence from a Latin-American country, International Journal of Quality & Reliability Management, published online October 2020. https://doi.org/10.1108/IJQRM-04-2020-0133.

Hossain, M. A., Hossain, M. M., & Chowdhury, T. H. (2018). Understanding the success of private universities: An empirical investigation from graduates' perspective. International Journal of Quality & Reliability Management. 35(1), 145-162.

ISO - International Organization for Standardization (2015). Quality management principles. Geneva: ISO.

Lieber, T. (2019). A general theory of learning and teaching and a related comprehensive set of performance indicators for higher education institutions. Quality in Higher Education, 25 (1), 76-97.

Loukkola, T., Peterbauer, H., & Gover, A. (2020). Exploring higher education indicators. European University Association.

Manatos, M.J., Sarrico, C.S., Rosa, M.J. (2017a). The integration of quality management in higher education institutions: a systematic literature review, Total Quality Management & Business Excellence, 28:1-2, 159-175, DOI: 10.1080/14783363.2015.1050180.

Manatos, M.J., Sarrico, C.S., Rosa, M.J. (2017b). The European standards and guidelines for internal quality assurance: An integrative approach to quality management in higher education?, The TQM Journal, Vol. 29 Iss 2 pp. 342 – 356.

Manatos, M.J., Rosa, M.J., Sarrico, C.S. (2018). Quality management in universities: towards an integrated approach? International Journal of Quality and Reliability Management, 35(1), 126-144 (https://doi.org/10.1108/IJQRM-04-2016-0046).

Marhl, M., & Pausits, A. (2011). Third mission indicators for new ranking methodologies. Evaluation in Higher Education, 5(1), 43-64.

Marimon, F., Mas-Machuca, M., & Berbegal-Mirabent, J. (2019). UnivQual : a holistic scale to assess student perceptions of service quality at universities quality at universities. *Total Quality Management & Business Excellence*, *30*(1–2), 184–200. https://doi.org/10.1080/14783363.2017.1302795

Palomares-Montero, D., & García-Aracil, A. (2011). What are the key indicators for evaluating the activities of universities? *Research Evaluation*, *20*(5), 353–363. https://doi.org/10.3152/095820211X13176484436096

Rosa, M.J. and Amaral, A. (2014) (Eds.). Quality Assurance and Higher Education. Contemporary Debates. Basingstoke: Palgrave MacMillan.

Rossiter, J. R. (2011). Marketing measurement revolution: The C-OAR-SE method and why it must replace psychometrics. *European Journal of Marketing*, *45*(11/12), 1561–1588. https://doi.org/http://dx.doi.org/10.1108/MRR-09-2015-0216

Sadiq Sohail, M., & Shaikh, N. M. (2004). Quest for excellence in business education: A study of student impressions of service quality. *International Journal of Educational Management*, *18*(1), 58–65. https://doi.org/10.1108/09513540410512163

Sánchez-Barrioluengo, M. (2014). Articulating the 'three-missions' in Spanish universities. Research Policy, 43(10), 1760-1773.

Santaolalla, R. C., Díaz, M. J. F., & Mantilla, J. M. R. (2017). Design and validation of a scale to

evaluate the impact of implementing a quality management system in schools. *Revista Complutense de Educacion*, 28(4), 1211.

Santos, S.M. (2011), Comparative Analysis of European Processes for Assessment and Certification of Internal Quality Assurance Systems, A3ES Readings, n° 1, A3ES, Lisboa.

SQELT (Sustainable Quality Enhancement in Higher Education Learning and Teaching) (2020). Sustainable quality enhancement in higher education learning and teaching. Performance data governance and management in higher education learning and teaching: a guideline. Erasmus+ Strategic Partnership. Available at https://www.evalag.de/sqelt/ (accessed 17 February 2020).

The Danish Accreditation Institution. (2019). Calculating quality: an overview of indicators used in external quality assurance of Higher Education in the Nordics. The Danish Accreditation Institution. https://akkr.dk/wp-content/filer/akkr/Calculating-quality-1.pdf

Urdari, C., Farcas, T.V. and Tiron-Tudor, A. (2017). Assessing the legitimacy of HEIs' contributions to society: The perspective of international rankings. *Sustainability Accounting, Management and Policy Journal*, Vol. 8 No. 2, pp. 191-215. https://doi.org/10.1108/SAMPJ-12-2015-0108

ANNEX 1. SMART-QUAL Quality Indicators Scoreboards. Items are arranged in the three mission groups and the fifteen standards.

| Teaching and learning | | | | |
|---|---|---|---|---|
| Name | Description | Formula | Basic / Recommended | Decision level |
| 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 programmes | | | | |
| Design of programmes | Appropriateness of intended learning outcomes, teaching, and assessment methods | NA | Basic | Operational |
| Programmes offer | Percentage of second and third cycle programmes | (Σ Second and third cycle programmes offered / Σ programmes offered) *100 | Recommended | Strategic |
| 3 Student-centred learning, teaching and assessment | | | | |
| Student engagement | The design of programmes 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 programmes offered | Σ International agreements that have incoming or outgoing mobility / Σ programmes offered | Recommended | Strategic |
| Time to degree completion | Average duration of study pathway | Average time until degree competition | Recommended | Tactical |
| 4 Student admission, progression, recognition and certification | | | | |
| Drop-out 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 | Operatinal |
| Graduation rate in specified time | Percentage of students completing the study programme within expected number of years | (Σ Graduates who completed the programme 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 programme | (Σ FTE teaching staff joining ERASMUS programme) / (Σ FTE teaching staff) *100 | Recommended | Operational |
| 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 & learning expenditure | Percentage of expenditure dedicated to Teaching & Learning activities | (Σ Expenditure on Teaching & 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 programmes with public information about quality | (Σ Current degree programmes with public information about quality / Σ Current degree programmes) *100 | Basic | Strategic |
| 9 On-going monitoring and periodic review of programmes | | | | |
| 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 & 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 programme / Σ Graduates) *100 | Recommended | Operational |
| 10 Cyclical external quality assurance | | | | |
| Compulsory accreditation of programmes | Percentage of programmes fully accredited through compulsory accreditation | (Σ programmes fully accredited through compulsory accreditation)/ (Σ programmes assessed through compulsory accreditation) *100 | Basic | Strategic |

| | | | | |
|---|---|---|---|---|
| Voluntary accreditation of programmes | Percentage of programmes fully accredited through voluntary accreditation | (Σ Programmes fully accredited through voluntary accreditation)/ (Σ Programmes assessed through voluntary accreditation) *100 | Recommended | Strategic |
| | | | | |
| Research | | | | |
| Name | Description | Formula | Basic / Recommended | Decision level |
| 11 Resoures | | | | |
| 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 |

| | | | | |
|---|---|---|---|---|
| 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 1st-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 | | | | |
| Name | Description | Formula | Basic / Recommended | Decision level |
| 13 Recruitment and social inclusion | | | | |
| 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 programmes per students enrolled | Σ Participants in lifelong learning programmes / Σ Students enrolled | Recommended | Operational |
| 14 Collaboration with stakeholders | | | | |

| | | | | |
|---|---|---|---|---|
| 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 |
| 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 |

ANNEX 2. Summary of SMART-QUAL indicators set.

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

| | | | |
|---|---|---|---|
| 9 | On-going monitoring and periodic review of programmes | • Graduate employment rate<br>• Overall student or graduate satisfaction<br>• Student satisf. with teaching & learning | • Graduate employment in related job |
| 10 | Cyclical external quality assurance | • Compulsory accreditation of programs | • Voluntary accreditation of programs |
| Research | | | |
| 11 | Resources | • Research funding<br>• Research projects | • Academic inbreeding<br>• Members in research units<br>• Research engagement |
| 12 | Results and impact | • Intellectual property dimension<br>• Research citations<br>• Research publications indexed | • Patents<br>• Research grants |
| Relationship with Society | | | |
| 13 | Recruitment and social engagement | • Recruitment of international students | • Financial aid to students<br>• Life-long learning |
| 14 | Collaboration with stakeholders | • Research partnerships | • Collaboration with stakeholders<br>• Students industry link |
| 15 | Impact in society | • Spin-offs | • Sustainability |