

# Implementation of an Internal Quality Assurance System at Pablo de Olavide University of Seville: Improving Computer Science Students Skills

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**Abstract.** This work describes how an internal quality assurance system is deployed at Pablo de Olavide University of Seville, Spain, in order to follow up all the existing degrees among the faculties and schools, seven centers in total, and how the teaching-learning process is improved. In the first place, the quality management structure existing in all the centers and degrees of the university is described. Additionally, all the actions related to the quality and improvement of the degrees of a center are reported. Unlike in other Universities, in the Pablo de Olavide University there is no specific procedure for monitoring degrees, but the strategic procedure *PE04: Measurement, analysis and improvement* of the Internal Quality Assurance System is used to carry out such a procedure. Therefore, the procedure is detailed specifying the different phases it consists of and those responsible for each of them. Once this procedure has been implemented, the centers have a follow-up report for each of their degrees, which also includes an improvement plan to be developed during the next course. The case of the degree of Computer Science in Information Systems, included in the School of Engineering, is analyzed over time in order to show how the implementation of such a system improves the overall performance of students.

**Keywords:** Quality · Innovation · Education · Students skills · Computer science

## 1 Introduction

The internal quality assurance is of utmost importance in educational centers because it relates to their trust [11]. The design of an Open System of Internal Quality Assurance (OIQAS) has been proved to be useful to improve the overall

process of learning [9]. The OIQAS can be described as the systematic, structured and continuous attention to quality with the aim of its maintenance and improvement. Within the framework of the training policies and processes that are developed in the universities, the OIQAS must allow such institutions to demonstrate that they take seriously the quality of their qualifications as well as their commitment to ensure and demonstrate this quality, which is not opposed to reach high research standards [10].

In the particular case of the Pablo de Olavide University (UPO), its seven centers (Faculty of Business, Faculty of Experimental Sciences, Faculty of Social Sciences, Faculty of Sport, Faculty of Law, Faculty of Humanities, School of Engineering) and degrees have been submitted to an external evaluation of the National Agency for Quality Assessment and Accreditation of Spain or ANECA, by its Spanish abbreviation ([www.aneca.es/eng/ANECA](http://www.aneca.es/eng/ANECA)), under the AUDIT program [3]. Furthermore, they have been submitted to an external evaluation of the Andalusian University Evaluation and Accreditation Agency, or AGAE by its Spanish acronym ([deva.aac.es/?id=acreditacion](http://deva.aac.es/?id=acreditacion)), under the VERIFICA program. After its implementation in both centers and degrees, it was submitted to the ANECA for a certification process of the Center, and to the AGAE for an accreditation process of the degrees. Once this objective was achieved, the availability of a certified IQAS in each center will facilitate the verification of future university degrees.

The development of the OIQAS, as in any other Spanish university or within the European Space, requires an adequate balance between the actions promoted by the institution itself (that is, the IQAS) and the external evaluation, audit [7] and certification procedures carried out by the Agencies (which constitutes the External Quality Guarantee) on which we depend, in particular the European Association for Quality Assurance (ENQA) for the European area, the ANECA for the national territory and the AGAE for the Region of Andalusia. In this sense, the agencies promote an articulation between the Internal Guarantee and the External Guarantee, also protecting, as one of their tasks, the implementation of the IQAS, closely linked to specific actions and programs.

In this context, and being aware of the importance of this articulation, the UPO attended in 2007 the ANECA's AUDIT Program call, and signing on October 25th 2007 an agreement by which it was committed to the implementation of IQAS in all its centers, and consequently, in all its degrees.

The UPO has prepared the manual with the guidelines to be followed by the IQAS of each center and its degrees, according to the AGAE procedures [1], which was eventually approved by Governing Council approved on July 7<sup>th</sup> 2008. The design of these systems includes actions that allow:

1. To determine the needs and expectations of students, employers and other groups of interest in relation to the training offered in the university.
2. To establish the IQAS objectives and scope in relation to the training programs.
3. To determine the internal quality assurance criteria.

The IQAS design forms an essential element in the policy and training activities of the UPO centers and degrees. For this reason, the centers must set in advance the objectives they expect to achieve as a result of their implementation. These objectives have been established autonomously by the them, but they are particular cases of the common objective that the UPO aims to achieve with the implementation of these systems, adapted to every center: to guarantee in a responsible way the quality of all the graduate and postgraduate degrees, reviewing and improving, whenever it is considered necessary, their training programs. This must be based on the needs and expectations of their stakeholders, to which they must keep informed promptly following an Institutional Communication Plan for the performance of accounts, also keeping permanently updated the own IQAS of each center and its degrees. With this as ultimate goal, it is expected:

1. Respond to the UPO's commitment with the satisfaction of the needs and expectations generated by society.
2. Order their teaching initiatives in a systematic way so that they contribute effectively to the quality assurance.
3. Facilitate the process of accreditation of the degrees implemented in the UPO centers.
4. Incorporate strategies for continuous improvement [12,14].
5. Offer the transparency required within the framework of the European Higher Education Area [6].

The rest of the paper is structured as follows. Section 2 describes the quality management structure at UPO. The follow-up protocol is detailed in Sect. 3. A results analysis can be found in Sect. 4. Finally, the conclusions drawn are reported in Sect. 5.

## 2 Quality Management Structure

The quality management structure [13] is composed of several members, as listed below:

1. The quality committee.
2. The delegate of the governing council, which is the body that approves its composition and regulations.
3. The monitoring and control committee for the strategic plan, whose composition and regulations depend on the senate.
4. The person in charge of quality and planning of the directors board, who is the vice-rector for quality and planning and acts by delegation of the rector.
5. The internal quality assurance committee (hereinafter, IQAC) of the centers, a consultative body under the quality committee, constituted by the vice-Rector for quality and planning, the quality and planning representatives of each center, the president of the student council and a representative of the planning, analysis and quality area.

6. The IQAC for Services, a consultative body under the quality committee, constituted by the vice-rector of quality and planning, the quality and planning members of each service, the president of the student council and a member from the planning, analysis and quality area.

Each center implements, in accordance with the UPO statutes, a quality management structure, which will be responsible for the center's IQAS and its degrees. This structure is composed of a quality and planning center manager and an center's IQAC, a quality and planning manager for each degree and an IQAC for each degree. The head of quality and planning of each center is appointed by the rector on the proposal of the dean or director of the center and the quality and planning manager of each degree, as well as the center's IQAC. The center and each IQAC's degree are appointed by the board of the center, which determines their skills in the elaboration, development, monitoring and improvement of the center's IQAS and its degrees.

In addition to that, the departments have their own quality management structure, composed of a quality committee chaired by the director of the department. The quality committee is appointed by the department council, which determines its skills in its internal operating regulations.

On the other hand, the Center for Postgraduate Studies (hereinafter CEDEP, as abbreviated in Spanish) has a quality management structure responsible for its IQAS and its degrees. This structure is composed of:

1. A head of quality and planning of the center, appointed by the postgraduate commission, proposed by the postgraduate vice-rector.
2. An IQAC for each macro area, present at the UPO, of those recognized by the Ministry responsible for higher education.
3. A person in charge of quality and planning for each degree.
4. An academic committee of each degree.

The head of quality and planning of each degree and the IQAC by macroarea and the academic committee for each degree are appointed by the graduate commission, which determines their skills in the preparation, development, follow-up and improvement of the IQAS of the CEDEP and its degrees.

In the case of degrees jointly coordinated between two universities (Pablo de Olavide University and University of Seville), the structure of quality management will be determined as stipulated in the respective collaboration agreement. Otherwise, it will be adapted to the general structure described in this section and, in any case, the different groups of interest must be represented.

### **3 Follow-Up Protocol**

The Spanish royal decrees 1393/2007 [4] and 861/2010 [5], by which the organization of official university education is established, offers the framework of the quality assurance of the training programs.

The quality assurance systems, which are part of the new curricula, are also the basis for the new teaching organization to function efficiently and to create the confidence on which the process of accreditation of degrees relies on.

In these royal decrees, the autonomy in the design of the degree is combined with an adequate system of evaluation and accreditation, which will allow to supervise the effective execution of the teachings and inform society about the quality of it. The concretion of the system of verification and accreditation will allow the balance between a greater capacity of the universities to design the degrees and the accountability oriented to guarantee the quality and to improve the information of the society on the characteristics of the university offer.

All the training programs leading to bachelor and postgraduate degrees, since their implementation proposal, have an IQAS. The centers possess a robust and powerful IQAS that allows them to monitor and control all their degrees, with the aim of guaranteeing the quality of the training programs for which they are responsible for.

The centers have mechanisms that allow them to maintain and renew their training offer and develop methodologies for the approval, control and periodic review of their programs. To this end, and in its different organizational levels:

1. Determine the groups of interest, bodies and procedures involved in the design, control, planning, development and periodic review of the degrees, their objectives and associated competencies.
2. They have information collection and analysis systems (including information from the national and international environment) that allow them to assess the maintenance of their training offer, its updating or renewal.
3. They have mechanisms that regulate the decision-making process regarding the training offer and the design of the degrees and their objectives.
4. They ensure that the necessary mechanisms are developed to implement the improvements derived from the process of periodic review of the degrees.
5. They determine the way (how, who, when) in which the groups of interest are held accountable for the quality of the teachings.
6. They define the criteria for the eventual suspension of the degree.

In all cases, and in the actions to guarantee the quality of the training programs of a center, the centers have criteria of quality in relation to:

1. The relevance of the justification of the degree and the needs of the groups of interest.
2. The relevance of the general objectives and skills.
3. The clarity and sufficiency of the systems that regulate the access and admission of students.
4. The coherence of the planned planning.
5. The adequacy of the academic and support staff, as well as material resources and services.
6. The expected efficiency in relation to the expected results.
7. The IQAS of the Center and its degrees.

And, finally, the centers take into account that training in any professional activity should contribute to the knowledge and development of the human rights, democratic principles, principles of equality between women and men, solidarity, environmental protection, universal accessibility and design for all, and promotion of the culture of peace, as contemplated by the royal decrees that regulate the university education.

In order to carry out the monitoring of university education, the AGAE designs a protocol and a specific procedure [2] on which the *PE04 procedure is based: Measurement, analysis and continuous improvement* of the IQAS of the centers and degrees of UPO, with which the UPO's training programs are monitored.

## 4 IQAS Analysis

This section is divided into three subsections. In particular, Sect. 4.1 analyzes the results derived from the IQAS. Later in Sect. 4.2 the IQAS reports analyses are discussed. Finally, some quality indicators directly related to the teaching-learning process, from the degree of computer science and information systems, are assessed in order to determine how the quality of a degree is improved in Sect. 4.3.

### 4.1 Results Analysis

The IQAC for Bachelor's degrees, and the Academic Committee, for Master's degrees, annually follow up the improvement plans approved in the previous revision of the IQAS and of the policy and objectives of quality of the degree. In addition, they analyze the indicators [8] related to the enrollment of students (*PC03: access, admission and enrollment of students of the centers*), the entrance/exit profiles (*PC04: Profiles of entrance/exit and recruitment of students*), adequacy of academic staff (*PA03: Recruitment and selection of academic and administrative staff and services, PA05: Evaluation of academic and administrative staff and services*), student mobility (*PC08: Management and review of the mobility of students*), external internships (*PC09: Management and Review of external internships*), job placement (*PC11: Management of job placement*), academic results (*PC12: Analysis of the results of the learning*) and the satisfaction of the groups of interest (*PA09: Satisfaction, needs and expectations of the groups of interest*).

The center's IQAC in the case of Bachelor's degrees and the Head of Quality and Planning of CEDEP in the case of Master's Degrees analyze the incidents, claims and suggestions of the center every year, respectively. They also analyze the general indicators related to the management of degrees (*PA02: File management and processing of degrees*) and adaptation of material resources (*PA06: Management of material resources*).

## 4.2 IQAS Reports Analysis

After the analysis carried out described in the previous section, the following reports are prepared:

1. Monitoring report on the center's quality objectives (Bachelors degree only).
2. Follow-up report on the quality objectives of the degree.
3. Annual monitoring report of the degree that includes:
  - (a) Results of the Improvement Plan established in the monitoring of the previous year.
  - (b) Summary of incidents, claims and suggestions.
  - (c) Assessment of the indicators included in the procedures mentioned in Sect. 3.
  - (d) Annual improvement plan for next year.

The annual follow-up report must be approved by the Center Board, in the case of Bachelor's degrees, and must be reviewed by the IQAC of the degree, and approved by the Graduate Commission, in the case of Master's degrees.

Likewise, each Center (except CEDEP) signs a Contract-Program of conditional financing, based on the objectives of the Plans, with the Vice-Rectorate of Quality and Planning and the Board of Directors of the UPO. Annual improvements included in the monitoring reports of the center's degrees, and whose follow-up will be carried out by the Planning, Analysis and Quality Department of the University.

## 4.3 Assessing Quality Indicators

As case study, we show the quality indicators associated to the School of Engineering and, in particular, to its Degree in Computer Science and Information Systems. Although many indicators are included in the degree annual report for quality, only those related to the students performance are here discussed. All data can be found at the IQAS UPO website, after authentication ([www.upo.es/calidad](http://www.upo.es/calidad)).

Table 1 refers to the evolution of the selected indicators over time, since the degree was implemented. The indicators are defined below:

1. Performance rate. It is defined as the total amount of credits passed divided by the total amount of credits enrolled.
2. Efficiency rate. It is defined as the amount of credits that a cohort of students should have been enrolled in divided by the actual credits enrolled.
3. Graduation rate. It is defined as the number of a students within a cohort that finish the degree in  $n$  or  $n + 1$  years (being  $n$  the number of years a degree is planned to be done) divided by the number of students that formed such a cohort during their first academic year.
4. Success rate. It is defined as the total number of credits passed divided by the total number the students are examined.

**Table 1.** Quality indicators evolution over time for the Degree in Computer Science and Information Systems. All values are expressed in %.

Year	Performance	Efficiency	Graduation	Success
2010–2011	48.24	N/A	N/A	68.42
2011–2012	47.91	N/A	N/A	77.06
2012–2013	61.43	N/A	N/A	81.25
2013–2014	58.35	93.41	N/A	81.02
2014–2015	60.69	90.66	16.95	84.30
2015–2016	62.25	80.04	18.33	84.26
2016–2017	57.25	88.78	11.11	77.14
2017–2018	61.33	87.60	14.81	78.89

Please note that some values of both efficiency and graduation rates are not available (N/A), since they could not be measured until the first cohort ended the degree.

As it can be seen, the performance and success indicators exhibit a very relevant increase from the first year (with no IQAS still implemented) to the last year measured (from 48.24% to 61.33% and from 68.42% to 78.89%, respectively). As for the efficiency rate, also slightly lower, it remains almost constant over time with a very high value for 2018 (87.60%). Finally, the variation of the graduation rate is hardly  $-2\%$ .

## 5 Conclusions

It is well-known that the implementation of an internal quality assurance system in public universities reports multiple benefits for both the institution and the students. In this paper, we have introduced how such a system has been implemented at Pablo de Olavide University. Thus, all roles and commissions are detailed. The Degree in Computer Science and Systems Information, belonging to the School of Engineering, is used as study case. The analysis of several quality indicators shows how this system has improved the teaching-learning process.

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