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**Indicators for the evaluation of Higher Education Institutions: a bibliographic review**

Selected theme: Positioning of higher education institutions

**Abstract**

Universities are undergoing changes involving the development of new roles and missions. Governments and institutions are implementing strategies to ensure the proper performance of universities through the use of indicator systems. We review some systems applied to the OECD countries, with special attention to Spain. We demonstrate the difficulty in establishing classification criteria for indicators.

**Introduction**

Higher Education Institutions (HEIs) around the world are undergoing important changes. Experts in the field of higher education (HE) affirm that the 21st century will be the period of the highest growth in HE in the history of education, with qualitative changes in the system such that HEIs will be forced to make important readjustments in order to fit with public sector financial management systems (Rodríguez Vargas, 2005; Leydesdorff, 2006; Bonaccorsi and Daraio, 2007).

According to the OECD (1999) and the European Commission (2006), universities are developing new roles and missions that have serious implications for their structures. At the same time, universities are carrying out processes of costs rationalization due, among others things, to the decrease in public research and development (R&D) funding and the increase in private funding. For example, in Germany, Spain and Portugal, between 1997 and 2005 public R&D funding decreased by 1.0%, 0.5% and 10.6% respectively, while private financing of universities increased by 2.4%, 5.6% and 13.7%, respectively (Eurostat, 2007).

To cope with these changes, governments and HE agencies are implementing strategies to improve HE efficiency and ensure optimal utilization of resources. Spanish universities have undergone a complete legal and structural transformation over the last few decades, which have resulted in major reforms to their systems. Governments are establishing new management forms for public institutions, the most important of which is greater autonomy, which demands greater efficiency, efficacy and responsibility from these organizations (LOU, 2007). In this context, many theoreticians think it is vital that universities are evaluated (Keller, 1999; Pla and Villarreal, 2001).

Evaluation of universities is a relatively recent phenomenon in Spain compared to other western countries; North America can be taken as the reference case (Blank, 1993; De Miguel, 2007). HE assessment is a complex process that requires previously agreed reliable and appropriate standards. Rather surprisingly, in a world where information plays an important role in the creation of new knowledge, we do not have information about how to develop such indicators (Bonaccorsi and Daraio, 2007). Thus, there has been an upsurge in studies on the evaluation of universities using different indicators systems (Douglas Williams, 1995; Aghion et al., 2007; van Vught, 2008; García-Aracil and Villarreal, 2009), which has resulted in a multiplicity of indicators in the literature that are addressed to teaching, research activities, transfer of research results or evaluation of several of these factors simultaneously. There is also a lack of adequate disaggregated data. Therefore, it is necessary to systematize the existing indicators to facilitate the establishment of criteria for decision making and classification of the factors related to evaluation (Oakes, 1989; Westerheijden, 1999; García-Aracil, 2007; Bonaccorsi and Daraio, 2007; Bonaccorsi et al., 2007).

In this paper we present a review of the indicators proposed by some OECD countries to evaluate HEIs, with special attention to those developed in Spain. The paper proceeds as follow: First, we present an overview of the historical evolution of universities. The next section justifies and defines the use of indicator systems for the evaluation of universities. Then, we present a review of the literature on indicators and in the concluding sections we provide comments and some final remarks.

**Overview of the historical evolution of universities**

The university is seen as the most important social space for the promotion of ideas and intellect. From their medieval origins to the beginning of the 19th century, European universities have been considered ‘temples of wisdom’, ‘ivory towers’ where intellectuals have produced and transmitted knowledge that has often been disconnected from the practical concerns of everyday life (Etzkowitz et al., 2000; Martin, 2002; Martin and Etzkowitz, 2000).

At the beginning of the 19<sup>th</sup> century, German universities contributed to the rise of a second mission that has become as important as teaching - research. At the end of the 20<sup>th</sup> century, Wilhelm von Humboldt’s vision of an institution in which research and teaching were linked, was adopted in many OECD countries (Geuna, 1999).

At the same time, HE was moving from being an elite system to becoming a ‘mass’ system achievable by the whole of society. This transformation, which can be explained by the spread of democratic education and the influence of the market in society, has provoked important changes in the university system as a whole. Among the most significant changes, OECD (1999) highlights: (i) change in government financing from a centralized model based on public subsidies for current expenditure (salaries for professors, costs of enrolled students, etc.) and public expenses on investment (infrastructures, buildings and equipment, etc.) to a diversified structure based on shared models of financing designed to provide greater financial stability; (ii) decrease in the role of government in the financing of R&D due to the transfer of the management of HE facilities to regional governments, in some cases such as the Spanish one; (iii) increased industry funding for R&D; (iv) stronger relationships between academia and industry promoting more efficient innovation networks; (v) internationalization of university research; and (vi) recognition of the importance of universities in the knowledge-based economy.

These changes have had two main effects. Universities have abandoned their ivory tower mentality, and there is increasing differentiation among institutions in their response to the demand for teaching and research (Scott, 1998; Martin, 2002). The increasing emphasis on the knowledge society, the globalization of services, the scientific-technical revolution and interest in economic welfare, in countries with competitive economies have all combined to promote the appearance of a new university model that includes the so-called ‘third mission’ in the name of entrepreneurialism, innovation and social commitment (Bricall, 2000; Martin and Etzkowitz, 2000; European Commission, 2006; Gulbrandsen and Slipersaeter, 2007).

In this new socio-political context, novel relationships among universities, research centres, public administrations and enterprises are being configured within the ‘entrepreneurial university’ (Clark, 1998; OECD, 1999; Davies, 2001; Manley, 2002).

The term ‘triple helix’ has been used to describe university-government-industry relationships related to the institutional transformations linked to the emergence of a global knowledge-based economy (Etzkowitz and Leydesdorff, 1997). The triple helix goes beyond the ‘Sabato Triangle’ model, in which although university, industry and government are linked, each performs its traditional role independently. In this model, the universities are described as ‘technological universities’ (Sabato, 1975). However, under the triple helix model, links connect each ‘helix’, so each entity can assume the others’ roles. Moreover, in the interaction spaces new universities are being developed, which are described as ‘business universities’ (Etzkowitz, 2008).

Thus, in the knowledge-based society, HEIs have three interrelated and inseparable missions: teaching, research and the new third mission of the direct connection between university research activities and the external economic and social world (Gibbons, 1999; Martin and Etzkowitz, 2000; Molas-Gallart, 2002; European Commission, 2005; Laredo, 2007). The challenge is to find an appropriate balance between these roles and responsibilities. This requires evaluation of universities’ resources, processes and results in order to: (i) improve efficiency (Bonaccorsi and Dario, 2007); (ii) speed-up and clarify the rendering of accounts (Lepori et al., 2007); (iii) advance knowledge about the social impact of education and the economic value of investment in education (Psacharopoulos & Patrinos, 2004); (iv) enable horizontal level comparisons of universities in similar environments and vertical level comparisons of the services being offered by individual universities (Bonaccorsi et al., 2007);

and (v) analyze the impact of universities on society (El-Khawas et al., 1998; Pla and Villarreal, 2001; Giménez-García and Martínez-Parra, 2006).

### **Justification for and conceptualization of indicator systems**

Indicator systems are frequently utilized for evaluation of HEIs and they are used for doing comparisons between institutions on an intra and trans-national level (Brooks, 2005; Williams & Van Dyke, 2007; Aghion et al., 2007). In Europe, since the late 1970s there have been proposals for the construction of indicators to evaluate universities (Cave et al., 1988; Barré, 2001; Molas-Gallart, 2002; Bonaccorsi & Daraio, 2006; Lepori et al., 2007). The indicators used for institutional evaluations can be based on quantitative or qualitative empirical data (Cave et al., 1988), and are commonly applied to measure the degrees of achievement of institutional missions and objectives.

The evaluation of HE systems and measurement of objectives achieved is complex. HE activity is considered as a multidimensional activity where teaching, research and knowledge transfer are combined. For this reason, there have been many methods proposed, and opinion differs about what is the most appropriate indicator system. De Miguel (1989) suggests five groups of indicators based on: (i) results (outputs); (ii) internal organizational processes; (iii) mixed or integrative criteria; (iv) organizational culture; (v) capacity for change. García Ramos (1989), following De Miguel's approach, proposes eight blocks of indicators: (i) results (outputs); (ii) link between resources and results (inputs-outputs); (iii) internal organizational processes; (iv) technical aspects of the organization; (v) cultural aspects of the organization; (vi) capacity to change; (vii) relationship of the organization and human factors; (viii) integrative criteria.

Other authors have developed other classifications (for more detail see Clark et al., 1984; Murnane, 1987; Blank, 1993; Wimpelber et al., 1989; Bricall, 2000; García-Aracil and Villarreal, 2009). In this paper, we adopt the classification proposed at the Spanish Council of Universities (Consejo de Universidades, 1999) which is based on a generic model for the evaluation of HEIs. Evaluation models generally fall into two categories: (i) those that emphasize the evaluation typology: (a) internal evaluation versus external evaluation; (b) peer review versus evaluation based on indicators; and (ii) those that emphasize the purpose of the evaluation: (a) institutional versus program; (b) inputs, processes and output; (c) quality, equity, effectiveness, efficiency and efficacy; (d) teaching, research and management; (e) third mission activities. In this paper we focus on the second of these categories (the purpose of the evaluation). In the next section we describe some of the most important indicators developed in various OECD countries, with special attention to Spain.

### **Indicators used to evaluate HEIs**

#### *Institutional versus program evaluation*

Public and private bodies are developing indicators to evaluate universities that take account of the context of the evaluation: the entire institution (Pla and Villarreal, 2001; García-Aracil and Daraio, 2009) or the individual program (Guerra et al., 1999; Stassen et al., 2001).

At the institutional level, we examine some OECD and ENQA (European Network for Quality Assurance in HE) proposals. The OECD through its INES (International Indicators of Education Systems) project has developed a system of education indicators for cross-national comparisons, and collected data from secondary sources on an annual basis. These indicators relate to the general educational context, including aspects such as economic and human resources (academic staff, technical and administrative staff, public expenditure on education, expenditure by student, etc.), educational processes (understood as instruments to enhance the performance of university activities such as size of class, faculty timetables, etc.) and the results achieved by the institution and their impact on society (measured by the literacy teaching index, participation in the labor market based on educational achievement, etc.) (OECD, 2008).

ENQA disseminates information, experience and good practice in the field of quality assurance in HE, based on consensus among a panel of experts, in order to guarantee external and internal quality of HEIs in the European HE Area (EHEA). Internal quality refers to intrinsic institutional operations and is mainly evaluated in house. Its main purpose is to guarantee quality, student evaluative processes, academic resources, and so on. External quality is the additional value that is gleaned from institutional best practice. This is judged by an

external agency, and the results provide objective and independent information. Mainly, external quality takes account of the procedures utilized by institutions to evaluate their internal quality (ENQA, 2009).

At the same time, the PRIME Network of excellence have developed some European projects, as AQUAMETH and CHINC project, which develop indicators at the level of individual institutions. One of the most important statements took into account under these projects is that the activity of HEIs is based on a multi-input, multi-output relationship where the contextual information needs to be introduced. Under this framework, six broad areas of variables are organized: i) general information; ii) revenues; iii) expenditures; iv) personnel; v) education production; and vi) research and innovation production (Bonaccorsi et al., 2007).

In the USA, the New England Association of School and Colleges (NEASC) has developed standards for evaluating all levels of education. These are related to the institutional mission, the planning and organization of the university, faculty (training and/or dedication to teaching, to research or to innovation activities), students and other resources (CIHE, 2007). At the same time, the Southern Association of Colleges and Schools (SACS), through its Expert Commissions, tries to enhance educational quality throughout the southern states of the US and to improve the effectiveness of institutions by ensuring that they meet the standards established by their respective HE communities. These Expert Commissions provide the incentive for institutions to strive their programs and services within the boundaries of their resources and capacities, and to create an environment in which teaching, public service, research, and learning occur, as appropriate to their individual missions (Commission on SACS, 2008).

In the UK, the UK's Quality Assurance Agency (QAA) is one of the most important independent bodies that carry out HE evaluations. It is the focus of most others references. QAA was established in 1997 by subscriptions from UK universities and colleges of HE, and through contracts with the main UK funding bodies. Its mission is to safeguard the public interest in standards of HE qualifications and to inform and promote continuous improvement in the management of the quality of HE. To do this, it works together with HEIs defining academic standards and quality. QAA assess some aspects, for instance, the institutional mission, academic infrastructure, role of students, admission policy, staff support, and so on (QAA, 2006). These institutional audits are developed in partnership with the HE Funding Council for England (HEFCE). Moreover, HEFCE, through its working groups, promotes and funds high-quality, cost-effective teaching and research to meet the needs of students, the economy and society. HEFCE analyses academic aspects (student numbers, results, employment of graduates, etc.), research activities (research income, publication of research results, etc.) and wealth generating activities (collaborative research with industry, commercialization of research results, licensing activities) (HEFCE, 2008).

In Spain, researchers at the University of Valencia (UVEG) and at the Spanish Council for Scientific Research (CSIC) in 2009 developed a scheme for evaluating the regional impact of entrepreneurial universities (García-Aracil and Villarreal, 2009). These indicators fall into nine categories: (i) changes in demand related to new knowledge areas, new specialties, etc. (e.g. numbers of enrolled and graduated students); (ii) changes in the environment in terms of the influence of private initiatives (e.g. numbers of public versus private institutions, student ratios by type of institution); (iii) limitations and/or financial or regulatory restrictions (e.g. public versus private budget); (iv) administrative ability in the institution to fuse together new managerial values and traditional academic values (e.g. existence of a strategic plan); (v) peripheral developments focusing on the relationship between the business and academic environments (spin-offs, etc.); (vi) financial diversification based on source of income (changes in the financial structure); (vii) academic stimulation or teaching function (enterprise activities); (viii) integration of entrepreneurial culture based on the business and innovator 'ethos' of the institution (e.g. programs to promote entrepreneurial activities); and (ix) assimilation of an entrepreneurial culture such as the integration of entrepreneurial promotion mechanisms (e.g. rewards for entrepreneurial activities). On the other hand, it is important to underline the efforts of the Quality Assurance Agency (AQU) for the University System in Catalonia (Spain). The purpose of AQU is assessment, accreditation and certification of quality in the field of

universities and HEIs in Catalonia. This Agency defined indicators for supply, demand/enrolments, access to university, human resources and student results (AQU, 2007).

For the evaluation of programs, UNESCO has produced some indicators for mission, objective, resources, curriculum and teaching methods for HE systems in East and West Europe (Vlăsceanu & Barrows, 2004).

In the USA, the Council for HE Accreditation (CHEA) analyses academic quality (student achievement), accountability (financial audit), promotion of change in terms of development of new study programs, administrative capacity (if procedures used at the organizational structure are right and democratic), continuous accreditation and availability of resources (facilities and equipment) (Eaton, 2006). The US Department of Education (USDE) focuses its accreditation efforts on quality of university programs. It has responsibility for the management and disbursement of public funds (Eaton, 2006). ABET (Accreditation Policy and Procedure Manual) assesses the institutional organization, the studies offered, admissions policy, academic staff, material resources and support services offered to student (ABET, 2006).

In Spain, ANECA (National Agency of Quality Assessment and Accreditation Trust) is responsible for monitoring the performance of the public HE service based on objective procedures and transparent processes. Its objective is to improve the positioning of universities in the national and international environment (ANECA, 2008). A group at University of Valladolid (UVA) in Spain (Guerra et al., 1999) has proposed some indicators to measure the profiles of university departments taking account of their structural parameters, academic achievements and research performance. These measurements are implemented through surveys.

Table 1 summarizes the evaluation methods described above.

Indicator systems for HE evaluation are designed to provide information about how closely universities are meeting their objectives (ENQA, 2005; QAA, 2006; CIHE, 2007; HEFCE, 2007; OECD, 2007; Commission on SACS, 2008). Most of the systems referred to above define the university mission and its organizational structure (see column 1). Whether they are used in an institutional or in a program evaluation, in distinguishing between the purposes and strategies of universities we can see how the available resources are being used.

Column 2 shows that the proposals which include indicators for admissions policy and access procedures, registration, and so on, are less frequent than those related to university mission.

These schemes also take account of teaching and research inputs and enable analysis of the opportunities for universities to develop their functions (see columns 3 and 4). Note that all these schemes, either directly or indirectly, make reference to resources (human, financial or equipment). However, not all of them include indicators for academic or research results (see columns 5 and 6) – see CIHE, SACS and the ANECA manual for Spain. Thus, these proposals would not be able to get performance, effectiveness or efficiency indexes based on the ratios between inputs and outputs.

Table 1. Review of indicators: Institutional evaluation versus program evaluation

	Mission, Organization	Admission Policy	Teaching <i>Inputs</i>	Research <i>Inputs</i>	Teaching <i>Outputs</i>	Research <i>Outputs</i>	Third Mission	Services to students	Programs / Institutions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Institutions	INES, 2008	X	X	X	-	X	-	-	-
	ENQA, 2009	X	-	X	-	X	-	X	X
	PRIME, 2007	X	-	X	X	X	X	X	-
	CIHE, 2007	X	X	X	X	-	-	X	X
	SACS, 2008	X	X	X	X	-	-	X	X
	QAA, 2006	X	X	X	-	X	-	X	X
	HEFCE, 2008	-	-	-	-	X	X	X	-
	García-Aracil & Villarreal, 2009	X	-	X	X	X	X	X	-
	AQU, 2007	X	X	X	X	X	-	-	X
Programs	UNESCO, 2004	X	X	X	X	X	-	-	X
	CHEA, 2006	-	-	-	-	X	-	-	-
	USDE, 2006	X	X	X	-	X	-	X	-
	ABET, 2006	X	X	X	-	X	-	X	X
	ANECA, 2008	X	X	X	-	-	-	-	-
	Guerra, 1999	-	-	X	X	X	X	-	-

Source: Own Elaboration

Table 1 shows that systems of indicators that include assessment of third mission activities are less numerous; however, most make reference to the exploitation of research results and advice to students (see columns 7 and 8, respectively).

Finally, we should underline the diffuse delimitation among proposals. Although this section has focused on the context in which the evaluation of institutions or programs is developed, it is interesting to see how ENQA, QAA, CIHE, AQU and SACS systems, which are oriented to university accreditation, have introduced indicators for the review and control of programs. Also, proposals such as UNESCO and ABET, which are oriented to the evaluation of programs, include indicators that relate to the institutional framework (see column 9).

*Evaluation of inputs, processes and outputs*

There are indicator systems that focus on the object being evaluated at the university. They consider HE as an input-output transformation process. It is sometimes difficult to distinguish between input and output, because some indicators refer to both teaching and research, or research and knowledge transfer. Process indicators are useful because they enable assessment of the institutional context, societal demand and the added value of social conditions.

At the international level, the Pan-Canadian Education Indicators Program (PCEIP), an initiative of the Council of Ministers of Education (CESC), provides information that is collected through surveys and secondary data sources, on the supply and demand of education, financing, student achievement, academic staff and labor market transition (CESC, 2006). The Association of Universities and Colleges of Canada (AUCC) publishes university indicators related to supply and demand of studies, infrastructures, financing and research resources (AUCC, 2008). In Australia the HE Council, and in Germany the Federal Agency of Statistics, provide information based on indicators on number of students enrolled, academic and non-academic staff, infrastructures and financial resources (UNESCO, 2003).

In Spain, the National University Quality Evaluation Plan (PNECU) has as main objectives to promote quality assurance systems for universities, to develop homogeneous methodologies to evaluate HEIs and to provide objective information about academic activities, production functions and the financial systems of HEIs (Consejo de Coordinación Universitaria, 2002). The University of Oviedo also in Spain (Miguel Díaz, 1999) has constructed indicators related to the evaluation of teaching results (e.g. success rates, professional human resources, student satisfaction); evaluation of teaching processes including use of resources (e.g. teaching load, student/professor ratio); evaluation of quality maintenance systems (e.g. attendance and class participation rate, student support system).

Table 2 summarizes the systems described in this sub-section.

In terms of inputs, all the systems referred to include indicators for human resources. Some focus on academic and non-academic staff; others focus on students. Only two of six proposals in Table 2 include indicators for infrastructures.

Table 2. Review of indicators: Inputs, processes and outputs evaluation.

	Human resources	INPUTS		PROCESSES			OUTPUT	3 <sup>rd</sup> Mission
		Economics	Infrastructures	Generals	Socials	Academics	Research	
CESC, 2006	X	X	-	-	X	X	-	-
AUCC, 2008	X	X	-	-	X	X	X	X
UNESCO (Australia), 2003	X	X	-	X	-	X	-	-
UNESCO (German), 2003	X	X	X	X	X	X	-	X
PNECU, 2002	X	X	X	X	-	X	X	X
University of Oviedo, 1999	X	-	-	X	-	X	-	X

Source: Own Elaboration

Indicators related to processes provide information on how institutional activities are performed. They distinguish between general processes, where student characteristics carry the greater weight (age, study preferences, time dedicated to study, etc.), and social processes, where the evaluation is focused on the student's social context (parents' educational level, household income, etc.).

In terms of outputs, the indicators provide data on academic results, but not all systems give information on research and third mission activities.

### *Evaluation of quality, equity, effectiveness, efficiency and efficacy*

In terms of evaluation, proposals have been developed that include indicators relating to the quality, equity, effectiveness, efficiency and efficacy of the HE system. Quality refers to the resources available at universities including improvements needed; equity refers to the egalitarian distribution of resources within the university system; effectiveness refers to the degree to the objectives of the university are achieved based on the difference between actual and forecast results; efficiency refers to the best use of resources; while efficacy in this context refers to the price of the results obtained (El-Khawas et al., 1998; OEI, 1998; Fernández, 1999; De Pablos Escobar and Gil Izquierdo, 2004).

Within this context, in the UK the PCFC Macro Performance Indicators proposal (Rodríguez Espinar, 1999) suggests a set of indicators of efficiency (cost of producing a graduate), effectiveness (number of successful students), and quality (student satisfaction, equipment). In the Netherlands, the University of Maastricht (Joumady and Ris, 2005) has been working on the reliability and validity of indicator systems and especially policies related to students and faculty, to quality control, to innovation and to the internationalization of universities.

In Spain, a research group from the University Complutense of Madrid (UCM) (De Pablos Escobar and Gil Izquierdo, 2004) using secondary data sources, has developed a system to measure quality (number of places, size of class), efficacy (graduated students versus enrolled students) and equity (student scholarships, own funding).

Table 3 shows that the UK, Dutch and Spanish proposals all take account of quality and equity. Only two (the UK and the Dutch schemes) include indicators for effectiveness and efficiency, while the Spanish scheme includes indicators for efficacy. It should be noted that the PCFC proposal in the UK is oriented to justifying government funding, while the Dutch proposal is focused more on process improvements and the Spanish scheme focuses on university ranking.

Table 3. Review of indicators: Quality, equity, effectiveness, efficiency and efficacy.

	Quality	Equity	Effectiveness	Efficiency	Efficacy
PCFC Macro Performance Indicators (UK), 1990	X	X	X	X	-
University of Maastricht, Joumady and Ris, 2005	X	X	X	X	-
UCM, Pablos Escobar y Gil Izquierdo, 2004	X	X	-	-	X

Source: Own Elaboration

### *Evaluation of teaching, research and management activities*

Universities are responsible for developing several activities getting different outputs. Some institutions have proposed a set of indicators grouping them as follows: teaching, research and management.

In France, the National Committee of Evaluation of Public Institutions (CNE), evaluates the country's cultural, scientific and professional institutions through surveys. From a public service point of view, it pays attention to teaching activities, research, management and institutional government (CNE, 2003).

In Spain, some universities have proposed indicator systems in this sense. The University of Seville, based on information derived from surveys, has proposed indicators for teaching (programs, degrees, subjects, teaching methodology, academic results), research (general resources, funding sources, research results) and university management (admission policy and human resources) (Chacón Moscoso et al., 1999). Work at the University of Burgos, based on information derived from surveys, has proposed a system of indicators for teaching quality and educational research, which emphasize resources over results (Tricio et al., 1999).

Table 4 presents a synthesis of the above proposals. It can be seen that the indicators relating to the teaching function are classified into indicators that provide information on subjects, resources, academic results and educational methodology. In terms of research activities, the proposals developed in Spain suggest indicators for economic and personal resources and research results. The French proposal includes indicators for production results and scientific diffusion. Indicators relating to management activities refer chiefly to admissions policy, financial management and human resources, documentation services and planning of the organizational structure.

Table 4. Review of indicators: Teaching, research and management activities.

	Teaching			Research			Management		
	Subjects	Resources	Results	Teaching methodology	Resources	Production, diffusion	Admission	Human Resources	Documentation
CNE. France, 2003	X	X	-	-	-	X	X	X	X
University of Seville, 1999	X	X	X	X	X	X	X	X	X
University of Burgos, 1999	X	X	X	-	X	X	-	X	-

Source: Own Elaboration

#### *Evaluation of Third Mission Activities*

The increased attention being given to the universities' third mission is based on the changing relationships between science and society, and to the growing social and economic role of knowledge production. However, there is no consensus on the definition of the concept of the third mission. There are three definitions that have been used in the literature: (i) additional sources of income; (ii) technology commercialization activities; (iii) extension work and commitment to the community (Molas-Gallart and Castro-Martínez, 2006). Although these concepts may appear similar, they refer to different objectives and political strategies.

The OECD has compiled certain statistical data which could be used R&D, technological and innovation indicators. These include the Frascati manual (OECD, 2002), the Technology Balance of Payments (TBP) manual (OECD, 1990), the Oslo manual (OECD, 2005) and the Patents manual (OECD, 1994). The latter three relate to the business context but can also be applied at the university level to evaluate third mission activities (European Commission, 2003, 2005).

The Frascati manual focuses on human resources analysis (R&D personnel) and financial resources (income and funding source) (OECD, 2002).

The TBP manual indicators evaluate and analyze the technology transfer processes (patents, licenses, know-how, trademarks, prototypes), technical and/or intellectual content services sources (technical support, contracts or training), technology diffusion (services with highly technological content) (OECD, 1990).

The Oslo Manual is a methodological guide to compiling statistical data on resources and the results of innovative activities, which can be extrapolated to HE. These indicators are used to carry out comparisons between technical and general institutions, different knowledge areas and different sized institutions (OECD, 2005).

The Patents manual analyses technological and scientific activities. The use of patents as indicators measures innovation activity outputs and the direction of technological change (OECD, 1994).

Also, the European Report on Science and Technology Indicators and the European Commission (EC) provide inputs that can be applied to the production, dissemination and absorption of knowledge (financial and human resources) and research scientific outputs (publications, patents and scientific honors) (European Commission, 2003).

In the US, the North Central Association of Colleges and Schools, through its Higher Learning Commission (HLC), evaluates and accredits the performance of education institutions through peer review evaluation based on five general criteria: i) institutional mission; ii) future vision; iii) student learning and capacity of faculty; iv) acquisition and application of knowledge; v) commitment and service to society (HLC, 2003). SPRU (Science and Technology Policy Research) at the University of Sussex, distinguishes among universities' capacities (knowledge and infrastructure) and activities (teaching, research and communication). It considers 12 categories of third mission activities and proposes 34 indicators, including number of patents, spin-offs, entrepreneurial activities, contracts with non-academic organizations (Molas-Gallart, 2002).

A European network of Public Agencies of Research and Universities has been implemented, which is called ProTon Europe. This European network evaluates the efficiency of European Technology Transfer Offices (TTO). The indicators proposed are based on innovation and organization theory, which matches most closely to the three directions of knowledge transfer: context, results and processes (ProTon, 2007). In Spain, TTO, worried about the need for information and management indicators, are setting up a working group on

indicators to get information about universities as institutions and to analyze how universities collaborate with businesses in their region over research (CRUE, 2006).

Table 5 presents the proposals for evaluation of third mission activities. There are some parallels with the Frascati and Oslo Manuals and the EC system, all of which propose statistics, and in the case of the EC Manual indicators related to resources, although with some differences. The Frascati Manual does not include statistics on the outputs of innovation activity. The Oslo Manual proposes economically quantifiable outputs, and the EC manual includes non-monetary outputs such as publications and scientific cooperation. The TBP and the patents manuals refer to transfer and technological diffusion activities, and university-businesses relationships through technical or intellectual advice services.

The SPRU, ProTon and Spanish TTO Network proposals are similar in that they all suggest indicators for the transfer of research results through patents, licenses, spin-offs, research contracts and consultancy activities. Furthermore, the US HLC proposal establishes generic criteria for how to respond to community needs and how to collaborate with business. The SPRU scheme includes indicators for the transfer capacities of teaching activities (employability and job satisfaction).

Table 5. Review of indicators: Evaluation of ‘third mission’ activities.

	Personal		Inputs			Total	Outputs			Circulation	
	General	Category	Internal Expenditure	Source	External Expenditure		Commercial Transactions	Patents / licenses	Turnover		Market share
Frascati M., 2002	X	X	X	X	X	X	-	-	-	-	-
TBP Manual, 1990	-	-	-	-	-	-	X	X	-	X	-
Oslo Manual, 2005	-	-	X	X	-	-	-	X	X	-	-
Patent M., 1994	-	-	-	-	-	-	X	X	-	-	X
EC, 2003	X	-	-	X	-	-	X	X	X	-	X
HLC, 2003	-	-	-	X	-	-	X	X	X	-	-
SPRU, 2002	-	-	-	X	-	-	X	X	X	-	-
ProTon, 2007	X	X	-	X	-	X	X	X	X	-	-
TTO, 2006.	X	X	-	X	-	X	X	X	X	-	-

Source: Own Elaboration

Finally, ProTon and the TTO Network include indicators that provide general information about universities and public research agencies, as well as the results of TTO activities. Synergies among these proposals will enable comparisons at European level. It is necessary to emphasize that the previous proposals do not only suggest indicators for the evaluation of results; they also introduce aspects relating to the university institution and its resources.

### Conclusions

We can see that HE indicators are essential tools for understanding and evaluating HEIs. In fact, there is an increasing request of HE indicators for strategic decision-making at all institutional levels. However, there are important problems due to lack of data or poor quality of data which do not allow using valid and reliable data.

This bibliographic review, although could be more extensive, demonstrates the complexity involved in analyzing the indicator systems proposed by national and international agencies and major research groups for the activities of HEIs.

Organizations such as UNESCO, OECD, EC and other agencies have established manuals, normative documents and guides aimed at achieving consensus in the establishment of indicators applied to the assessment of HEIs (UNESCO, 2004; OECD, 2007; European Commission, 2006). The construction of indicators needs to be validated in the community before the new indicators are used at HE evaluations. However, no consensus has been achieved to date.

Our attempts to organize some of these indicators systems show that the borders between some of these proposals are not clearly defined. We have tried to distinguish between indicators system oriented to evaluate institutions, programs, university missions, etc. However, we found this task very difficult. For example, we can find some proposals presented at the “Institutional versus program evaluation” section which could be presented at the “Evaluation of teaching, research and management activities” section. This happens because indicator systems do not have only an objective; they are complex and have multiple dimensions.

There is another difficulty related to the definition of indicators: should they be quantitative or qualitative? Should data analysis be descriptive, inferential or multivariable? The degree to which each proposed scheme defines the indicators is also significant. Some proposals are concerned with establishing absolute or relative value indexes, while others are limited to formulating generic 'reports'.

There are also differences in terms of the categories used to define these indicators, for instance, in the case of infrastructures resources, some compute the number of places (Chacón Moscoso et al., 1999), others consider the available area (De Pablos Escobar and Gil Izquierdo, 2004), yet others measure student places (Miguel Díaz, 1999). So, we might know that these indicators, although give information about the same issue, are not fully comparable.

On the other hand, most of the indicator systems shown in this paper present a list of indicators related to aggregate data or in other cases applied in a single or a few HEIs. There have been limited attempts to develop indicators at the level of institutions.

Taking into account the proposals for evaluation of third mission activities, we can see that most assess the impact of research results (patents, spin-off companies, funds raised from the market, etc.) but ignore employability of graduates, graduates' labor market returns, and so on, which they would give us information about the social labor market.

Moreover, there is an additional difficulty. Universities, which are responsible for different activities as teaching, research, innovation and general contributions to the culture, have also diverse kind of resources. In this sense, following Bonaccorsi et al., (2007) there are complex links between the different dimension, especially between input and outputs variables. In this kind of analyses we have to take into account the endogeneity problem.

Our study shows how difficult it is to establish criteria to classify the existing indicators, given the multiple objectives of HE and the variety of principals and stakeholders involved. To solve these problems is fundamental both to the rationale for policy, and for the relevance and practical use of indicators. For that reason it is useful to discuss what indicators are the best ones since give rise to consensus among policy-makers and university community members. In this sense, it is expected that there will be a move towards greater coherence among quality systems in the coming decades.

## References

- ABET (2006). *Accreditation policy and procedure manual. Effective for evaluations during the 2007-2008 accreditation cycle*. <http://www.abet.org/>
- AQU (2007). *El Sistema Universitari Públic Català 2000-2005: Una Perspectiva des de l'avaluació d'AQU Catalunya*. Barcelona: AQU.
- Aghion, P., Dewatripont, M., Hoxby, C., Mas-Colell, A., & Sapir, A. (2007). Why Reform Europe's Universities? *Bruegel Policy Brief*, 4, 1-8.
- ANECA (2008). *Manual de procedimiento para la evaluación de las solicitudes de implantación de títulos oficiales de grado y master*. <http://www.aneca.es/>
- AUCC (2008). *The Directory of Canadian Universities*. [http://www.aucc.ca/publications/auccpubs/directories/dcu/dcu\\_e.html](http://www.aucc.ca/publications/auccpubs/directories/dcu/dcu_e.html)
- Barré, R. (2001). Sense and nonsense of S&T productivity indicators. *Science and Public Policy*, 28 (4), 259-266.
- Blank, R. K. (1993). Developing a System of Education Indicators: Selecting, Implementing and Reporting Indicators. *Educational Evaluation and Policy Analysis*, 15(1), 65-80.
- Bonaccorsi, A., & Daraio, C. (2006). Developing micro-based indicators of institutional differentiation in HE systems. *Paper presented at the International Conference on Science, Technology and Innovation Indicators. History and New Perspectives*, Lugano 15-17 November.
- Bonaccorsi, A., & Daraio, C. (Eds.) (2007). *Universities and Strategic Knowledge Creation* (pp. 31-81). Northampton: Edward Elgar.
- Bonaccorsi, A.; Daraio, C.; Lepori, B. & Slipersaeter, S. (2007). Indicators on individual higher education institutions: addressing data problems and comparability issues. *Research Evaluation*, 16(2), 66-78.
- Bricall, J. M. (2000). *Universidad 2mil*. Madrid: CRUE.

- Brooks, R. (2005). Measuring university quality. *The Review of Higher Education*, 29, 1-21.
- Cave, M., Hanney, S., Henkel, M., & Kogan, M. (1988). *The use of performance indicators in higher education* (1<sup>st</sup>ed). London and Bristol: Jessica Kingsley Publishers.
- CESC (2006). *Education Indicators in Canada, 2005*. <http://www.statcan.gc.ca/pub/81-582-x/2006001/pdf/4225856-eng.pdf>
- Chacón Moscoso, S., Pérez Gil, J. A., & Holgado Tello, F. P. (1999). Indicadores de calidad en la universidad de Sevilla. Análisis de contenido. In Consejo de Universidades (Ed.), *Indicadores en la Universidad: Información y decisiones* (pp. 385-400). Madrid: MEC.
- CIHE (2007). *Standards for Accreditation. Commission on Institutions of Higher Education. New England Association of Schools and Colleges*. [http://cihe.neasc.org/downloads/Standards/Standards\\_for\\_Accreditation\\_2006.pdf](http://cihe.neasc.org/downloads/Standards/Standards_for_Accreditation_2006.pdf)
- Clark, D., Lotto, L. S., & Astuto, T. A. (1984). Effective schools and school improvement: A comparative analysis two lines inquiry. *Educational Administration Quarterly*, 20(3), 41-68.
- Clark, B. R. (1998). The entrepreneurial university demand and response. *Tertiary Education Management*, 4(1), 5-15.
- CNE (2003). *Livre des références*. Paris: Comité National d'Évaluation. <http://www.dcsf.gov.uk/londonbologna/uploads/documents/QualiteLivredesRefCNE.EN.pdf> (translation in English)
- Commission on SACS (2008). *Principles of accreditation Foundations for Quality enhancement*. <http://www.sacscoc.org/pdf/2008PrinciplesofAccreditation.pdf>
- Consejo de Coordinación Universitaria (2002). *Catálogo de Indicadores del Sistema Universitario Público Español*. Madrid: MEC.
- Consejo de Universidades (Ed.) (1999). *Indicadores en la Universidad: Información y decisiones*. Madrid: MEC.
- CRUE (2006). Informe RedOTRI 2006. Madrid: CRUE.
- Davies, J. L. (2001). The emergence of entrepreneurial cultures in European universities. *Higher Education management*, 13(2), 25-43.
- De Miguel, M. (1989). Modelos de investigación sobre organizaciones educativas. *Revista de Investigación Educativa*, 7(13), 21-56.
- De Miguel, M. (2007). *Acreditación de educación superior*. Madrid: CIS.
- De Pablos Escobar, L., & Gil Izquierdo, M. (2004). Algunos indicadores de eficiencia, eficacia y calida del sistema de financiación de la universidad. In J. Grao Rodríguez (Ed.), *Economía de la educación*. Actas de las XIII jornadas de la AEDE.
- Douglas Williams, J. (1995). The Challenge of Developing New Educational Indicators. *Educational Evaluation and Policy Analysis*, 17(1), 113-131.
- Eaton, J. S. (2006). *An Overview of U.S. Accreditation*. Santa Barbara: CHEA.
- El-Khawas, E., Depieto-Jurand, R., & Hola-Nielsen, L. (1998). *Quality Assurance in Higher Education: Recent progress; Challenges ahead*. Paris: World Bank.
- ENQA (2009). *Standards and guidelines for quality assurance in the European Higher Education Area. ENQA*. [http://www.enqa.eu/files/ESG\\_3edition%20\(2\).pdf](http://www.enqa.eu/files/ESG_3edition%20(2).pdf)
- Etzkowitz, H. (2008). *The Triple Helix. University-Industry-Government, Innovation in Action*. London and New York: Routledge.
- Etzkowitz, H., & Leydesdorff, L. (1997). *University and the Global Knowledge Economy. A Triple Helix of University- Industry- Government Relations*. London: Pinter Publishers.
- Etzkowitz, H., Webster, A., Gebhardt, C., & Catisano, B. R. (2000). The Future of the University and the University of the Future: evolution of ivory tower to entrepreneurial paradigm. *Research Policy*, 29, 313-330.
- European Commission (2003). *Third European Report on Science and Technology Indicators, 2003*. Brussels: European Commission.
- European Commission (2005). *European Universities: Enhancing Europe's Research Base*. Brussels: European Commission.
- European Commission (2006). *Communication from the Commission – Delivering on the modernisation agenda for universities: education, research and innovation*. Brussels: European Commission.

- Eurostat (2007). *Total intramural RandD expenditure (GERD) by source of funds*. Luxembourg: Eurostat.
- Fernández, J.M. (1999). *Manual de Políticas y Legislación Educativa*. Madrid: Síntesis.
- García-Aracil, A. (2007). Expansion and reorganization in the Spanish higher education system. In A. Bonaccorsi & C. Daraio (Eds.), *Universities and Strategic Knowledge Creation* (pp. 376-401). Northampton: Edward Elgar.
- García-Aracil, A., & Daraio, C. (2009). The efficiency of Spanish Public Universities: An investigation of economies of scale and scope, and trade-offs in teaching versus research. *Economics of Education Review*, forthcoming.
- García-Aracil, A., & Villarreal, E. (2009). Some indicators to measure regional impact of entrepreneurial universities. *Management Science*, forthcoming.
- García Ramos, J. M. (1989). Extensión de la evaluación. In R. Pérez Juste & J. M. García Ramos (Eds.), *Diagnóstico, evaluación y toma de decisiones* (pp. 315-385). Madrid: Rialp.
- Geuna, A. (1999). An Evolutionary Account of European Universities. In A. Geuna, *The Economics of Knowledge Production. Funding and the Structure of University Research* (pp. 35-60). Northampton: Edward Elgar.
- Gibbons, M. (1999). Science's new social contract with society. *Nature*, 402, 11-18.
- Giménez García, V., & Martínez Parra, J. L. (2006). Cost efficiency in the university. A departmental evaluation model. *Economics of Education Review*, 25(5), 543-553.
- Guerra, C., Lecue, M., Rueda, E. M., & Vázquez, P. (1999). Un sistema de indicadores para analizar el perfil de los departamentos de una universidad generalista. In Consejo de Universidades (Ed.), *Indicadores en la Universidad: Información y decisiones* (pp. 157-186). Madrid: MEC.
- Gulbrandsen, M., & Slipersaeter, S. (2007). The third mission and the entrepreneurial university model. In A. Bonaccorsi & C. Daraio (Eds.), *Universities and Strategic Knowledge Creation* (pp. 112-143). Northampton: Edward Elgar.
- HEFCE (2008). *Strategic Plan 2006-2011*. [http://www.hefce.ac.uk/pubs/hefce/2008/08\\_15/08\\_15.pdf](http://www.hefce.ac.uk/pubs/hefce/2008/08_15/08_15.pdf)
- HLC (2003). *Institutional Accreditation: An Overview*. Chicago: Commission of the North Central Association of Colleges and Schools.
- Joumady, O., & Ris, C. (2005). *Determining the relative efficiency of European Higher Education institutions using DEA*. Maastricht: ROA Maastricht University.
- Keller, G. (1999). The New Importance of Strategic Management at Universities. *Universitat: Estratègies per avançar*, UPC, Barcelona.
- Laredo, P. (2007). Revisiting the third mission of universities: toward a renewed categorization of university activities? *Higher Education Policy*, 20(4), 441-456.
- Leydesdorff, L. (2006). *The Knowledge-based economy: modeled, measured, simulated*. USA: Universal Publisher Boca Raton.
- Lepori, B., Benninghoff, M., Jongbloed, B., Salerno, C., & Slipersaeter, S. (2007). Changing models and patterns of higher education funding: some empirical evidence. In A. Bonaccorsi & C. Daraio (Eds.), *Universities and Strategic Knowledge Creation* (pp. 85-111). Northampton: Edward Elgar.
- Lepori, B.; van den Besselaar, P.; Dinges, M.; van der Meulen, B.; Poti, B.; Reale, E.; Slipersaeter, S. & Theves, J. (2007). Indicators for comparative analysis of public project funding: concepts, implementation and evaluation. *Research Evaluation*, 16 (4), 243-255.
- LOU (2007). BOE n. 89 de 13/04/2007.
- Manley, K. (2002). The Systems approach to innovation Studies. *Australian Journal of Information Systems*, 9(2), 94-102.
- Martin, C. J. (2002). La misión de la universidad en el S.XXI: ¿Torre de marfil, parque de diversión, oficina comercial o pensar lo impensable? *Sociologica*, 48, 11-40.
- Martin, B., & Etzkowitz, H. (2000). The origin and evolution of the university species. *VEST*, 13, 9-34.
- Miguel Díaz, M. (1999). La evaluación de la enseñanza. Propuesta de indicadores para las titulaciones. In Consejo de Universidades (Ed.), *Indicadores en la Universidad: Información y decisiones* (pp. 413-430). Madrid: MEC.

- Molas-Gallart, J. (2002). *Measuring Third Stream Activities*. United Kingdom: University of Sussex.
- Molas-Gallart, J., & Castro-Martínez, E. (2006). Ambiguity and conflict in the development of 'Third Mission' indicators. Paper presented at *The 9th International Conference on Science and Technology Indicators*, Lovaina.
- Murnane, R. J. (1987). Improving Education Indicators and Economic Indicators: The Same Problems? *Educational Evaluation and Policy Analysis*, 9(2), 101-116.
- Oakes, J. (1989). What Education Indicators? The Case for Assessing the School Context. *Educational Evaluation and Policy Analysis*, 11(2), 182-199.
- OECD (1990). *Proposed Standard method of compiling and interpreting technology balance of payments data. TBP Manual*. Paris: OECD.
- OECD (1994). *The measurement of scientific and technological activities. Using patent data as science and technology indicators. Patent Manual*. Paris: OECD.
- OECD (1999). *University research in transition*. Paris: OECD.
- OECD (2002). *Frascati Manual*. Paris: OECD.
- OECD (2005). *Proposed guidelines for collecting and interpreting technological innovation data. Oslo Manual*. Paris: OECD.
- OECD (2008). *Education at a Glance 2008: OECD Indicators*. Paris: OECD.
- OEI (1998). *World Declaration on Higher Education for the Twenty-first century: Vision and Action..* París: UNESCO.
- Pla, A., & Villarreal, E. (2001). Measuring the Internal Efficiency of Universities: Social Demand, Diversity and Rising Costs. Paper presented at the *XXIII Annual EAIR Forum*. University of Porto, Porto.
- ProTon (2007). *The ProTon Europe 2005. Annual Survey report*. Valencia: INGENIO, CSIC-UPV.
- Psacharopoulos, G. & Patrinos, H.A. (2004). Returns to investment in education: a further update. *Education Economics*, 2, 111-134.
- QAA (2006). *Handbook for institutional audit: England and Northern Ireland, 2006*. Mansfield: AQQ.
- Rodríguez Vargas, J. J. (2005). *La Nueva Fase de Desarrollo Económico y Social del Capitalismo Mundial*. <http://www.eumed.net/tesis/jjrv/>
- Sabato, J. (1975). *El pensamiento latinoamericano en la problemática Ciencia-tecnología-desarrollo-dependencia*. Buenos Aires: Paidós.
- Scott, P. (1998). Shaking the ivory tower. *The UNESCO courier: a window open on the world*, 51(9), 18-20.
- Stassen, M. L. A., Doherty, D., & Poe, M. (2001). *Program-based review and assessment*. US: University of Massachusetts.
- Tricio, A., Bol, A., Vitoria, R., Quindos, M. P., & Serna, M. (1999). Una experiencia departamental en evaluación de la calidad y adaptación de los indicadores para investigación, enseñanza y gestión. In Consejo de Universidades (Ed.), *Indicadores en la Universidad: Información y decisiones* (pp. 231-250). Madrid: MEC.
- UNESCO (2003). *System-Level and Strategic Indicators for Monitoring Higher Education in the Twenty-First Century*. Bucharest: UNESCO.
- van Vught, F. (2008). *Mapping Diversity. Developing a European Classification of Higher Education Institutions*. Netherlands: CHEPS.
- Vlăsceanu, L. & Barrows, L.C. (eds.) (2004). *Studies on higher education. Indicators for institutional and programme accreditation in higher tertiary education*. Bucharest: UNESCO.
- Westerheijden, D. F. (1999). Innovations indicators in science and technology: comments from a higher education point of view. *Scientometrics*, 45(3), 445-453.
- Williams, R. & Van Dyke, N. (2007). Measuring university performance at the discipline/departamental level. Paper presented at the *Griffith University Symposium on International trends in university rankings and classifications*, 12 February.
- Wimpelberg, R., Teddlie, C., & Stringfield, S. (1989). Sensitivity to context: the past and the future of effective school research. *Educational Administration Quarterly*, 25(1), 82-127.