Informatics Management Systems for Quality Management Improvement in Higher Education and Scientific Research

Lidia NICULITA, Iolanda COLDA and Steluta NASTASA, Romania

ABSTRACT

Quality assurance reflects the ability of an organization providing education to offer learning programs, according to the asserted standards and it is thus promoted so as to lead to the ongoing improvement of educational quality.

This paper proposes an experimental informatics system which identifies a quality assurance framework, develops indicators of institutional performance, creates databases for user-defined information needs, and provides access to information at all institutional levels. The informatics solutions explored use of performance indicators and demonstrated an information structure through which all staff can contribute to institutional decision making and operation. The objectives of the conceptual framework will contribute to certificate the quality management system of organization.

SUMMARY

The Council of Europe does not recognize or in any other way bestow legitimacy on any higher education institution, program or provision (SPRING EUROPEAN COUNCIL 2008). Institutional recognition is normally within the competence of national authorities and is normally conditional on the institution or programs undergoing quality assessment.

In Europe, this is the policy adopted by the Ministers responsible for higher education in the framework of the Bologna Process aiming to establish a European Higher Education Area by 2010. In 2005, the Ministers adopted a set of European Quality Assurance Standards, which are based on a background report elaborated by ENQA – the European Association for Quality Assurance in Higher Education and partners.

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There is the crucial condition that only higher education institutions that are successfully reviewed by a national registered quality assurance or accreditation agency, or that are otherwise officially recognized will be included in European Higher Education Area.

Since the late 1990s, enrollments in Information Technology and Information Systems-related academic programs have declined sharply. A number of efforts underway at various universities and professional organizations in the areas of redesigning core curriculum and developing secondary programs are described as well as marketing and promotion approaches (GRANGER M, 2007).

In June 2008, a team of researchers of Technical University of Civil Engineering of Bucharest conceived an Informatics Management System as a planned system of methods, tools and procedures for quality assurance for educational and scientific research activities. It is focused on two components:

- the quality management component – for the university staff management level, specific for higher education and scientific and technological research;
- the quality assurance activities – as the most important measuring system. There is a computer hardware and software systems which has hierarchy structure including subsystems and modules specialized in data collecting, analysis and control and communication management, via internet.

The pilot case studies will be tested in 2009 on two higher education and scientific research universities: Bucharest Academy of Economic Studies and University of Civil Engineering of Bucharest. It will be enumerable UML modulations, using quantitative and qualitative provision techniques.

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1. INTRODUCTION

The ISO 9000 family of international standards is primarily concerned with "quality management". This means what the organization does to fulfill:
–   the customer`s quality requirements, and
–   applicable regulatory requirements, while aiming to
–   enhance customer satisfaction, and
–   achieve continual improvement of its performance in pursuit of these objectives.
From a historical perspective quality has passed through several stages:
–   **quality audits** – activities undertaken to measure the quality of products or services that have already been made or delivered. In itself a quality audit has no impact on quality;
–   **quality control** – processes are monitored to ensure that all quality requirements are being met and performance problems are solved;
–   **quality assurance** covers all activities from design, development, production, installation, servicing and documentation. It includes the regulation of the quality of raw materials, assemblies, production and inspection processes;
–   **quality management** includes all activities that managers carry out in an effort to implement their quality policy. These activities include quality planning, quality control, quality assurance and quality improvement;
–   **total quality management** is defined as a management approach that aims to achieve and sustain long-term organizational success by encouraging employee feedback and participation, satisfying customer needs and expectations, respecting societal values and beliefs and obeying governmental statutes and regulations.

In the context of higher education we should understand under the term "product/service" the "outcome of the educational process" and use the term "customer" in the broad sense of the meaning. So there are external customers, such as prospective employers, or society as a whole, and internal customers, such as academic staff and students. It is very important to specify the student as an "internal customer", to underline the importance of his/her role in the formation of outcomes.

Quality is determined by clear and acceptable characteristics/objectives and regulatory statements (regulations). Regulations in higher education can be divided in two main parts: **external regulations,** creating **"external" quality assurance and internal regulations** (institutional self-regulations), and creating **"internal" quality assurance.**

External regulations are the principles, rules, expectations and conditions which define the scope and the nature of regulation, and are determined by a regulatory authority which is independent of the higher education provider. These requirements must be satisfied in order to

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operate (JACKSON, 2006). External requirements are according to their nature, usually minimum requirements, but in some cases also typical requirements (institutional audit).

Internal regulations relate to the activities and actions of a higher education provider which is not subject to external regulatory controls. The principles, rules, expectations and conditions which define the scope and the nature of regulation are determined by the institution although they will be influenced by interaction with the constituencies and markets it serves (JACKSON, 2006). These requirements are usually typical and/or maximum requirements and presume that minimum requirements are set on the external level and are met by the institutions. When talking about internal regulations, we are usually thinking about institution-wide regulations and overlooking individual self-regulations (internal quality audit).

In the last decade, many European universities have increased their interest in applying principles of quality management to higher education. There is general agreement on the tools of quality management; however, there is limited discussion and no universally agreed upon model of quality management.

The Prominent Quality Management Systems used Worldwide (HEYNS, 2001)
The following is a summary of some prominent quality management systems and approaches used throughout the world:
- Malcolm Baldridge National Quality Award
- European Quality Management Award
- Australian Quality Award
- The Koalaty Kid Program
- The Deming Prize
- The ISO 9000/2000 Quality Management Code of Practice
- Investors in People
- The South African Excellence Model
- The Balanced Business Scorecard
- The Scottish Quality Management System

The European Association for Quality Assurance (ENQA) is struggling to catch up with the developments in the theory of quality and adhere to quality management. It has defined measurable criteria for the quality education: policy and procedures for quality assurance; approval, monitoring and periodic review of programs and awards; assessment of students; quality assurance of teaching staff; learning resources and student support; information systems and public information (ENQA Bergen Report, 2005).

In 2005, in Romanian higher education system was established a quality assurance legal framework, in accordance with the European registered in the field. Consequently, there have been implemented **internal quality assurance mechanisms in universities** (following the recommendations of EU, as a well as the commitments endorsed within the Bologna process). The higher education system is integrated, as a distinct and most important component, in the R&D and innovation system.

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2. KEY CONCEPTS

OPERATIONAL CONCEPTS OF EDUCATIONAL QUALITY

The main operational concepts regarding quality in education are:

- *Educational quality* (quality of education) is the set of characteristics of a training program and of its provider, through which expectations of beneficiaries and also the standards of quality are satisfied.

- *Assessment of educational quality* refers to the multicriterial examination of the degree in which an organization and its program fulfils the referenced standards.
The assessment of educational quality is constituted by multi-criteria based examination of the extent to which an institution providing education and its program reach to reference standards.
When quality assessment is supplied by the same institution providing education, it turns into an **internal assessment.**
When quality assessment is supplied by a national or international agency, it turns into an **external assessment.** It refers to the assessment of institutional capacity and of the educational effectiveness of the providing educational institution. The assessment applies to:
- quality management at institutional level,
- quality of the provided programs,
- concordance between internal assessment and the real situations,
- comparative trans-institutional assessment of the same study program offered by different educational institutions.

- *The assurance of educational quality* is achieved through a set of development actions, which refer to the capacity of the educational institution to elaborate, plan and implement study programs and to generate the trust of beneficiaries in the capacity of the educational institution to satisfy their requirements.
The internal quality assurance will be realized through the establishment, at the level of each educational provider in Romania, of a *Commission for quality assessment and assurance*. The educational provider elaborates and adopts its own strategy and its own functioning rules for its Commission.
The duties of the *Commission for quality assessment and assurance* are:
- elaboration, coordination and application of procedures and activities of assessment and quality assurance,
- yearly implementation of an internal assessment regarding organizational educational quality,
- cooperation with ARACIS.

The internal assessment is the corner stone of quality assurance in higher education. The extern evaluation is a condition of the credibility of the results of the internal evaluation.

- *Control of educational quality* in educational institutions involves operational activities and techniques, systematically applied from an authority designed to verify the fulfillment of pre-established standards.

- *Improving educational quality* involves assessment, analysis and continuing corrective actions from the educational institution providing the educational program, based on selecting and adopting the best procedures and, also, the choice and application of the most relevant reference standards.

RECENT DEVELOPMENTS

The knowledge in management environment research in organizational and processes modeling, particularly, in quality management system of higher education explore ways in which appropriate definition of quality management could be implemented within the institution and supported through the development of an information system. In the quality management framework it was developed a series of indicators of institutional performance, created data basis based upon user – defined information requirements and provided an interface to the information which could be used at all levels within institution. While the performance indicators might play within quality management, the final outcome is too limited (LLAMOSA, 2005, FASANO, 1995).

CHARACTERISTICS OF THE APPROACH AND MODELING OF THE PROPOSED INFORMATICS SYSTEM

The Informatics Management Systems for Quality Management Improvement in Higher Education and Scientific Research proposed would be an instrument used to improve the quality of the internal quality assurance.
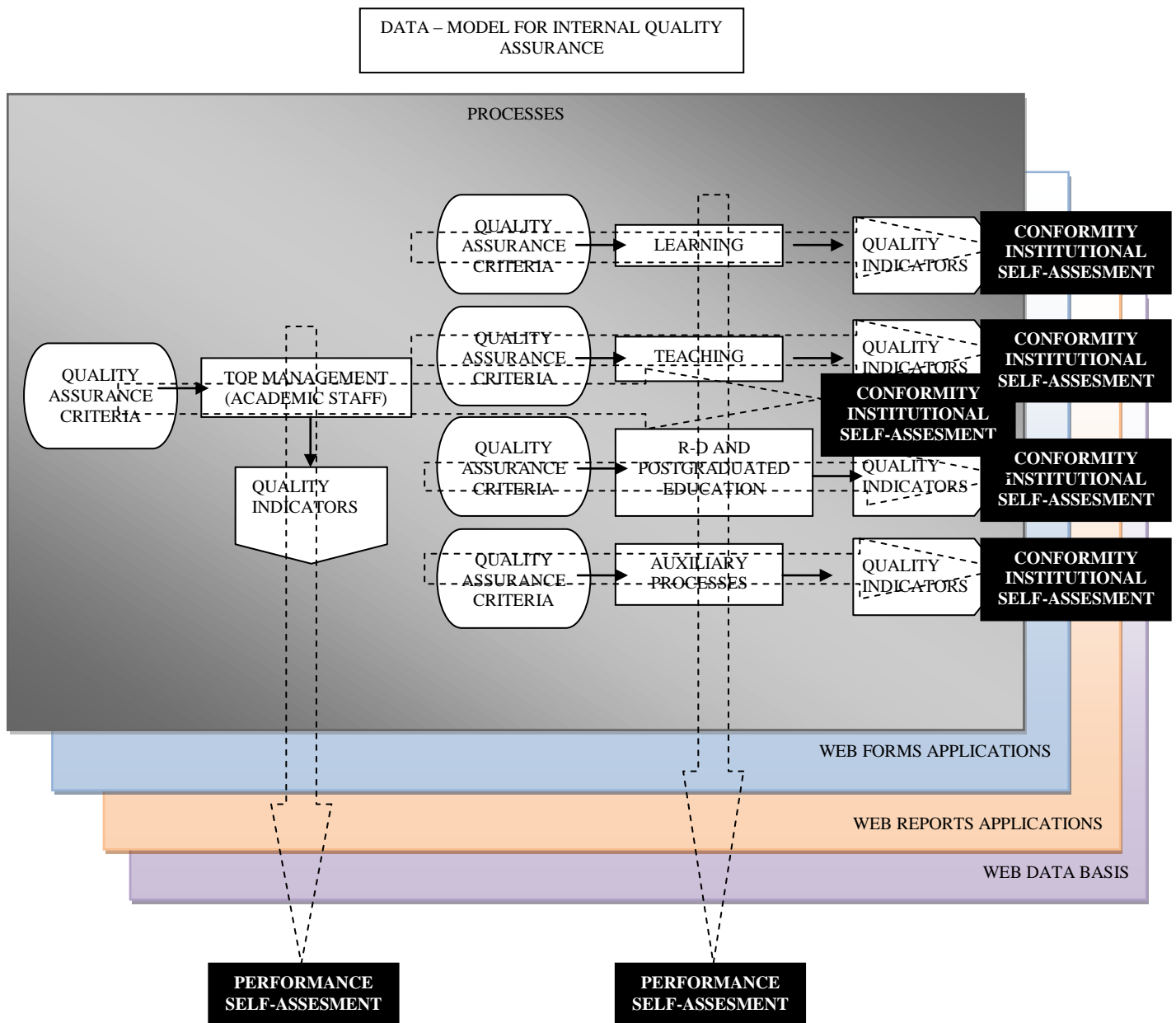
It helps institutions to integrate a mechanism for quality assurance and quality development with institutional planning and resources allocation at all relevant levels of institutional operation.

The aims and objectives of quality assurance processes are determinate before the processes themselves are developed and can be published with a description of the procedures to be used.

The Informatics Management System is conceived as a planned system of methods and procedures for quality assurance for educational and scientific research activities. It is focused on two components:
- the quality management component – for the university staff management level, specific for higher education and scientific and technological research;
- the quality assurance activities – as the most important measuring system. There is a computer hardware and software systems which has hierarchy structure including subsystems and modules specialized in data collecting, analysis and control and communication management, via internet.

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The architecture proposed (see Figure1) starts from process approach of the development of the activities quality in higher education. Like a modular system, will ensure the generation of special reports of specific activities and general reports. Every level allows the communication with others informatics communication systems, in country or abroad (National Register of Professional Qualification – comparable and compatible with its European equivalent, ACPART agency – for compatibility between preuniversity level and university level etc).

Figure 1 – Data – model for internal quality assurance

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The components of the quality assurance methodology regarding education are:
- **criteria** – refer to a grounding organizational and functioning aspect of an organization providing education.

Quality assurance activity is based on explicit **criteria** that are applied consistently, published by a national or international agency for Quality Assurance in Higher Education, national law of quality assurance in education, national ministerial orders specific higher education system.
- **standards and reference standards** – a standard represents the description of requirements established in terms of rules or results that define the minimum compulsory level at which an activity in education may be accomplished;

Standard used are developed and regularly reviewed by National Agency for Quality Assurance in Higher Education, at national level.
- **performance indicators** – a performance indicator represents a measurement tool of the degree in which an activity of a given organization providing education is accomplished according to standards or reference;

Performance indicators used are developed and regularly reviewed by National Agency for Quality Assurance in Higher Education – for education system and by National University Research Council – for Scientific Research, at national level (se Figure 2).

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Figure 2 – Performance indicators for scientific research process

The approach is based on a detailed inventory of statistical information requirements, including indicators needed for the monitoring and external assessment.

The system makes it possible to enter data from several academic years in data basis and facilitates longitudinal analyses, thus improving data quality.

A selection of pre-defined reports is corresponding to the main requirements identified (raw data and indicators defined according to national and international standards and norms).

Reports are able to automatically accommodate to national specific features.

The exploitation of this informatics systems helps, for universities, to:
- establish systems capable of producing relevant, reliable and timely statistical data, by building their technical, institutional and human capacities;
- any private, public or juridical person, interested in providing education, must comply with the process of assessment and accreditation, according to existing laws, before starting its activity (temporary authorization of functioning or accreditation). In terms of accreditation, the quality of education represents a permanent priority of each an any institution, organization or learning unit, as well as of its employees;
- self – evaluation is an institutional political tool (it reveals a picture of the institution: values, ways of governance, and visions of its mission. It reflects its operating methods).

3. CONCLUSION

The implementation of the quality assurance system in universities will pose a great challenge since the cultural change required is incredibly hard to reach. We hold as extremely important the creation of a so called work culture, of a quality culture in universities so that all actors on this stage understand how important the quality of their work is to the overall performance of the organization.

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BIOGRAPHICAL NOTES

Lidia NICULITA is professor at the Technical University of Civil Engineering of Bucharest, courses Quality management and Industrial Installations Technology and Assembly and Director of Department **Quality Assurance**. She developed more than 120 research papers in the following domains: Measurement and control equipment, integrated measurement systems, quality management and quality assurance, Activity of development and publishing papers: 9 specialty books, more than 60 articles and scientific papers in specialty publications in the country and abroad, more than 80 research papers based on contract.

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