Role of Business Intelligence Systems in Croatian Higher Education Quality Assurance

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Abstract - Quality assurance in higher education in Croatia is conducted by and in line with the European standards and guidelines developed by the European umbrella organization for quality assurance in higher education, European Association for Quality Assurance in Higher Education (ENQA). One of the standards for internal quality assurance directly relates to the information management stating that “Institutions should ensure that they collect, analyse and use relevant information for the effective management of their programmes and other activities.” Internal quality assurance is, or should be, at the core of every higher education institution, influencing its performance and quality perceived by its users, but also external evaluators (e.g. government and professional bodies that regulate or influence the work of the institution). Higher education institutions can ensure the quality of their services only through a well-developed internal quality assurance system that can provide information for timely decisions. This paper will analyse the requirements and obligations that higher education institutions have regarding the collection, processing and analysis of data within the scope of their work. In addition, it will provide examples of existing and possible use of information systems that lead to improvement of internal quality assurance system of the higher education providers.

I. INTRODUCTION

A. Business Intelligence Concept

Regardless of whether we define Business Intelligence (BI) in a broader sense, as an IT-based managerial philosophy [1], or in a narrower sense, as information technology that helps organisations manage business information, the ultimate role of the BI is the same – to provide reliable and up-to-date information for timely decision-making.

Although the term Business Intelligence is mostly used in relation to private/commercial businesses, the role it fulfills should also be important in decision-making at institutions operating in public interest, which is a fundamental role of higher education institutions (HEIs). It could be argued that the responsibility towards the taxpaying public is more important for publicly funded HEIs than for private ones, which are primarily responsible to their owners.

Whether we generally consider Business Intelligence as a process, or IT software solutions that support decision making, data is behind everything. Based on a large amount of data (sometimes referred to as Big Data) on all business processes, institutions should be able to assess their current position and decide on how to reach the intended goal, to the mutual satisfaction of employees and users of services. This goal is very similar to those of quality assurance.

B. Quality Assurance Concept

The concept of quality assurance (QA) has become an inescapable descriptor of business performance in the last two decades, both in private and public sector. Higher education systems, and HEIs in particular, have not been spared the new work paradigm. The notion of quality assurance is being introduced into the higher education systems throughout Europe, mostly within official procedures of assessing quality of HEIs. In the Croatian higher education system, the concept of quality assurance was introduced first as a part of prescribed procedure of institutional re-accreditation, and subsequently in all external evaluation procedures in Croatian higher education and science. An independent national public body, Agency for Science and Higher Education (ASHE), was established and modelled after the best European practices in quality assurance in science and higher education. ASHE is tasked with carrying out different external quality assurance evaluations, with institutional re-accreditation being the most (data) demanding, by evaluating HEIs’ provision of education services against legal requirements, as well as institutional development of quality assurance and, ultimately, quality culture1.

Although quality is not (all) about data, part of every external evaluation procedure is submission of considerable amount of data regarding core activities of the evaluated institution. Within the framework of each external evaluation procedure, the assumption is that the institution has relevant and reliable data about its activities2. The collection and managing of data on HEIs’ core activities (study programmes, students, employees, etc.) and sharing that data with other stakeholders (ASHE, Ministry of Education and Science, National Statistics Bureau) are partly regulated by different national regulations. Assessing the quality of data on HEIs’ activities, the way in which they are collected and analysed, i.e. used in decision-making, is part of the internal and external quality assurance system. Therefore we could argue that information system supporting the quality assurance system and management processes, helps enhancing the overall

1 In its Glossary of Basic Terms and Definitions in Higher Education Quality Assurance, UNESCO defines quality assurance as “An all-embracing term referring to an ongoing, continuous process of evaluating the quality of a higher education system, institutions, or programmes,” and for the quality culture states that “it refers to a set of shared, accepted, and integrated patterns/principles of quality to be found in the organizational cultures and the management systems of institutions.”

2 ESG, Standard 1.7. of the Standards and guidelines for institutional quality assurance (Institutions should ensure that they collect, analyse and use relevant information for the effective management of their programmes and other activities).
success, and to provide assessable information about quality assurance system [2].

C. Business Intelligence in quality assurance

If we presuppose that all HEIs maintain data on their (business) activity, regardless of whether this is driven by need for improvement, or just complying with regulations, it can be asserted that HEIs have some kind of Management (Business Intelligence) information system. Some institutional systems are more advanced, but all of them maintain data on their respective business processes. How HEIs use their data in (strategic) decision-making procedures that contribute to quality assurance is subject to evaluation within external evaluation procedures, especially institutional re-accreditation and audit. This paper will outline all the requirements placed on HEIs regarding the collection and management of data that are part of their business system. Whether there is a possibility of developing better and improved Business Intelligence system for (strategic) decision-making in higher education, is a question that requires future research.

II. QUALITY ASSURANCE IN HIGHER EDUCATION

A. Quality assurance in higher education

Defining what quality assurance in higher education is, and which procedures and methods should be used to assure and improve it, is not an easy task, neither for national bodies tasked with monitoring quality assurance, nor for HEIs themselves. Quality does not refer to the same for students, their parents, society, labour market or HEIs. Each stakeholders group has its own perspective towards quality of higher education.

In order to evaluate perceived quality from the perspective of each of the stakeholder group, European Association for Quality Assurance in Higher Education (ENQA) has, in cooperation with the European Students’ Union (ESU), the European Association of Institutions in Higher Education (EURASHE) and the European University Association (EUA), developed The Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) [3]. All (national) quality assurance agencies that aim at membership of ENQA have to undergo external evaluation by foreign experts consortium formed by ENQA in order to prove their ESG compliance in all their evaluation procedures. One of the biggest benefits of being an ENQA member is ensuring better assessment and (automatic) recognition of HE qualifications on the European level, and worldwide.

The ESG have 3 integral parts that provide guidelines for establishing quality assurance of a higher education system in a country:

- Part 1: Standards for internal quality assurance,
- Part 2: Standards for external quality assurance,
- Part 3: Standards for quality assurance agencies.

Main differences between guidelines for evaluation criteria for internal and external quality assurance are provided in Figure 1.

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Figure 1. Main differences between guidelines for evaluation of internal and external quality assurance

Source: ESG (2015)

Basic idea behind the ESG and quality assurance system is that institutions have to build and enhance their internal QA system, which should support decision-making process on the basis of analyses of institutional procedures and data. External QA agencies, such as ASHE, are expected to evaluate the quality of internal QA system of HEI.

B. Quality assurance in Croatian higher education

Systematic quality assurance in higher education and science in Croatia began in 2010 with the re-accreditation of all Croatian HEIs, conducted by the Agency for Science and Higher Education. Becoming a full member of ENQA and being listed in EQAR (European Quality Assurance Register for Higher Education), both in 2011, the Agency proved its reliability as a quality assurance agency working in the European Higher Education Area. In the period 2010-2016, ASHE re-accredited all public and private HEIs in Croatia, in accordance with the national regulations, but also in line with the ESG.

In order to provide relevant data and evidence within the procedure of institutional re-accreditation, but also other external evaluation procedures conducted by ASHE, HEIs have to submit a considerable amount of data about their (business) activities into ASHE’s information system MOZVAG. Collecting and analysing data on HEIs activities was found the most demanding and time-consuming part of the evaluation procedure(s), both for HEIs and ASHE.

Within the legally prescribed procedure of re-accreditation, which is the most demanding external evaluation procedure, HEIs have to submit a significant amount of data concerning all aspects of institutional activities that are being evaluated through national Standards for evaluation of the quality of HEIs, in line with the ESG. Areas being evaluated are: I) Internal

3 ENQA is an umbrella organisation which represents its members at the European level and internationally, especially in political decision making processes and in co-operations with stakeholder organisations (https://enqa.eu/).

4 ASHE information system for data collection in external evaluations, system description available here: https://wiki.srce.hr/display/TUT2/Moduli++novaa+verzija+Mozvaga
quality assurance and the social role of the higher education institution, II) Study programmes, III) Teaching process and student support, IV) Teaching and institutional capacities and V) Scientific/artistic activity. To better understand the amount of data involved, Fig. 2 shows the content of the Analytical Supplement, which is a mandatory document in re-accreditation, and is automatically created from the MOZVAG system based on HEI’s data entered manually or transferred from other systems. All data within the second assessment area - study programmes - are provided for each study programme that HEI delivers, which for some HEIs can be more than 30 programmes.

The data in the mentioned systems can provide a good basis for the development of institutions’ Business Intelligence System.

III. BUSINESS INTELLIGENCE SYSTEMS AND QUALITY ASSURANCE

Some studies have shown that the use of information technology has a positive impact on the quality assurance procedures of HEIs, both for HEIs themselves and for agencies conducting external evaluations [4].

Using different software and applications and/or developing information systems for collecting, processing and analysing data on core activities of HEIs is nowadays more rule than exception. Therefore, it is not surprising that assessing the quality of these tools is also a part of overall quality assurance system, whether internal or external.

Investing in development of a system that will support everyday processes and decision-making at HEIs is not only driven by desire for a better analytical basis for decision-making, but is often, especially for public HEIs, the result of existing obligations arising from different legal regulations and requirements of different external evaluations procedures. Private HEIs are forced to invest more in the quality of decision-making systems to ensure sustainability, since their funding is not secured by public money. Nevertheless, requirements concerning quality assurance of Croatian HEIs do not differ between private and public HEIs.

Within re-accreditation of HEIs conducted in the first cycle (2010-2016) it has been noted that HEIs do not adequately use their existing data and information for improving their business processes. For example, most of HEIs keep updated information on student grades and progression, but only a small number of them use this data to identify students who are at risk of dropping out.

A. Data requirements in national regulations (legal and procedural requirements)

The Act on Scientific Activity and Higher Education [5], stipulates in Article 90. that “Higher education institutions electronically keep records and data collections, process the collected personal and other data for the purpose of performing tasks within their jurisdiction.”

The mandatory data that HEIs should collect and process include:

- register on students’ personal data, their exams and other study requirements,
- register of issued certificates of completion of studies and acquired academic and professional titles and academic degrees;
- records on the personal data of employees, teaching staff and teaching load;

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5 https://www.isvu.hr/javno/hr/index.shtml
6 https://www.bib.irb.hr/
7 https://pdb.irb.hr/
• other records prescribed by law, implementing acts and general acts of the higher education institution;

In addition, the same Article also stipulates that the process of keeping and maintaining mandatory records shall be an integral part of the internal quality assurance and improvement system, and shall be subject to the external quality assurance and quality improvement procedures.

Ordinance regulating the requirements for performing higher education activity and re-accreditation of higher education institutions [6] in Articles 17 and 18 stipulates that HEIs have to establish information system for collecting, managing and processing data on the organisation of higher education institution and the organisation and delivery of study programmes, as well as information on quality assurance. Moreover, within re-accreditation of higher education institution, the required information system has to be evaluated.

The audit, as an external evaluation procedure, assesses the efficiency and degree of development of the internal quality assurance system of a HEI in accordance with national [7], European (ESG, 2015) and international standards, as well as its continuous improvement of quality culture. One of the audit criteria dealing with implementation and monitoring of the QA processes is assessing in what way HEI collects, manages and uses information in a decision-making process.

B. Data requirements in line with the ESG

The ESG are the basis for quality assurance in the European Higher Education Area (EHEA). They are used by HEIs and QA agencies as a reference document for building and developing internal and external quality assurance. It is important to emphasize that the responsibility for quality assurance, according to ESG, lies primarily with the higher education institution. That is the reason why internal quality assurance system of HEI is an integral part of quality of HEI's business activities in general.

Some of the standards for assessment of the internal quality assurance system directly cite the need for an information system as a basis for data collection. The analysis of this data should lead to better process management and quality assurance in core activities. Those standards are:

• 1.4 Student admission, progression, recognition and certification

…Institutions need to put in place both processes and tools to collect, monitor and act on information on student progression.

• 1.7 Information management

Institutions should ensure that they collect, analyse and use relevant information for the effective management of their programmes and other activities.

Reliable data is crucial for informed decision-making and for knowing what is working well and what needs attention. Effective processes to collect and analyse information about study programmes and other activities feed data into the internal quality assurance system. The following data is of interest:

-- Key performance indicators;
-- Profile of the student population;
-- Student progression, success and drop-out rates;
-- Students' satisfaction with their programmes;
-- Learning resources and student support available;
-- Career paths of graduates.

• 1.8 Public information

Institutions provide information about their activities, including the programmes they offer and the selection criteria for them, the intended learning outcomes of these programmes, the qualifications they award, the teaching, learning and assessment procedures used, the pass rates and the learning opportunities available to their students as well as graduate employment information.

• 1.9 On-going monitoring and periodic review of programmes

Institutions should monitor and periodically review their programmes to ensure that they achieve the objectives set for them and respond to the needs of students and society

C. Existing IT solutions in higher education and science with a potential for Business intelligence system

As mentioned, Business Intelligence system can use different information sources that combined provide quality data and analyses for decision-making.

In Croatia there are several possible information systems and platforms that provide possibilities to maintain data on the part of activity of HEIs, and, more important, they are free of charge for all HEIs. Those solutions are ISVU, CROSBI and Database of project activities, which combined provide most of the data necessary for quality data analysis of core activities of HEIs.

Information System of Higher Education Institutions (ISVU) is a project funded by the Croatian Ministry of Science, Education and Sports started in the 2001. ISVU is comprehensive information system that provides support for education related processes taking place within a higher education institution. As a part of the project, a data warehouse was developed to provide reporting and analytical feature. Unfortunately, the Ministry failed to ensure that all HEIs submit data to ISVU, regardless of whether they use ISVU or other software to maintain their data and legally prescribed datasets. Today, around 80% of HEIs use ISVU as their main information system for data management on students and teaching process.

Data on HEIs bibliography, including all publications of their teachers, can be stored in CROSBI, and data on project activities of a HEI can be entered in...
recently upgraded Database of Project Activities in Science and Higher Education. Both databases are maintained by the Centre for Scientific Information of the Ruđer Bošković Institute, and offer connectivity to other systems, including MOZVAG.

In addition to these existing information systems, Information system on Croatian Scientific Activity (CroRIS), which is currently being developed within EU funded project “Scientific and Technological Prediction”, anticipates to store and analyse all relevant data on scientific activity in Croatia. Since it is still under construction, its contribution to development of Business Intelligence in the higher education system remains to be seen.

IV. CONCLUSION

In today's digital world, the use of information systems and IT tools to store and analyse data is implied. Higher education institutions in Croatia strive to live up to these expectations, but due to the lack of a unique solution for everyone to apply, the quality of data collection and processing varies among the institutions. In quality assurance procedures, the ASHE evaluates, among other things, the quality of data collection and processing. The external evaluations conducted by ASHE so far indicate the need to improve the use of existing information sources, primarily through linking data, especially in terms of creating a business intelligence system.

Although HEIs use several different information systems to record information about their activities, they do not recognise the opportunities offered by linking all data and creating information system that would be used for improvement of their organisational and decision-making processes. The external evaluations conducted by ASHE so far indicate the need to improve the use of existing information sources, primarily through linking data, especially in terms of creating a business intelligence system.

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[5] ‘The Act on Scientific Activity and Higher Education (Official Gazette 123/03, 198/03, 105/04, 174/04, 02/07, 46/07, 45/09, 63/11, 94/13, 139/13, 101/14, 60/15)’.
[6] ‘Ordinance on the content of licence and conditions for issuing licence for performing higher education activity, carrying out a study programme and re-accreditation of higher education institutions (OG 24/2010)’.

LIST OF FREQUENTLY USED ACRONYMS

ASHE Agency for Science and Higher Education
CROSBI Croatian Scientific Bibliography
ENQA European Network for Quality Assurance (since 2004: European Association for Quality Assurance in Higher Education)
HEI Higher Education Institution
ISVU Information System of Higher Education Institutions (in Croatian: Informacijski Sustav Visokih Učilišta)
MOZVAG ASHE information system for data collection in external evaluations
QA Quality Assurance