Available online at www.sciencedirect.com

SciVerse ScienceDirect

Procedia Economics and Finance 3 (2012) 1170 – 1176

Procedia Economics and Finance

www.elsevier.com/locate/procedia

Emerging Markets Queries in Finance and Business

XSRL – taxonomy of scientific reporting

Bogdan Ionescu[a,*], Iuliana Ionescu[a], Florin Mihai [a], Andrei Stanciu[a]

[a] *The Bucharest University of Economic Studies, 6, Romana Square, district 1, Bucharest, Romania, postal code: 010374*

Abstract

In the present paper, we intend to define a parallel between XBRL concept and a new concept defined by authors, called XSRL eXtensible Science Reporting Language in order to analyze the opportunity of transposing XBLR technology from financial reporting to scientometrics reporting. The new concept XSLR analyses the opportunity of operating semantically with science-type taxonomies, defined according to the model of financial reporting architecture.

Keywords : XBRL concept; XML concept; scientometric reporting; financial reporting; taxonomies;

1. Introduction

In a world governed by knowledge, the science has a universal nature. Transition to an economy based on knowledge represents a fundamental strategically option having an important impact on the durable global development of the world. The universities, research institutes and all other entities involved in scientific output on corporative, governmental and national level play an important role in the development of society based on knowledge by its contribution to creating, transferring, dissemination and using the information in the process of transforming the data in information and knowledge. The essential role of universities consists in training the human resource high qualified, which implies a symbiosis between higher education and research, thus, the performance of educational system contributes to a large extent to the society development.

* Corresponding author. Tel.: +40 722593695;
E-mail address: bogdan.ionescu@cig.ase.ro., ionescub@gmail.com

doi:10.1016/S2212-5671(12)00292-4

2. Scientometrics reporting in Romania

The universities´ scientific research represents an inseparable component of a high-performing education system and also a significant factor for developing the higher education system so as to become able to accomplish the educative role on social and economic development whether national, regional and local level. The research results are materialized in various reports describing the unfolded activities, involved resources and results achieved. From scientometric standpoint these results are quantified by indicators.

In terms of liability to report the scientific output of the researchers, the scientometrics reporting could be either normative or selective. In fact, the normative reporting means the responsibility of universities, research institutes and other public and private organizations involved in scientific research for reporting their scientific output on components, according to several criteria assessed by the national and international entities of regularization of science policy. The scope of research results reporting is extended from the researcher level to the collective level, involving at the same time the research teams, research centers, faculties, universities, countries, etc.

The individual attempts from disseminating the scientific results become visible by promoting the researchers´ scientific work using online platforms with the purpose of gathering all the information about the scientific results achieved from the research work and, also, disseminating of these results. The paper authors have much experience concerning information modeling, as well as, the designing and implementing of platforms called *«e-ScientRoChair»* and *«e-UnivRoScient»*, by which it is possible to determine the researcher´s profile by simply analyzing him scientific portfolio, on level of research collective, e-ScientRoChair and level of university ,e-ScientRoChair, as well.

Besides, Borya Shakhnovich have developed a web-service called "iAMscientist" by which several scientific papers related to their authors can be identified, by different fields of scientific concerns. Basically, any researcher from Romania or the over world will be able to access a portal and obtain, both information related to scientific activities providing from the portfolio of individual researchers and entities they come from, and the scientific profile of these researchers, depending on certain criteria of scientometric quantification.

Within the scope of the program ENEC, National Exercise for Evaluating of Research Quality, financed by European funds, the agency UEFISCDI, Executive Agency for Higher Education Research and Innovation Funding has performed a Research Evaluation Support System SISEC. The project´s aim consists in a quantitative and qualitative evaluation according to the international standards of scientific research from Romanian universities. Based on the information uploaded by the researchers of the Romanian universities, such an evaluation is operational through an electronic platform that is able to generate the result of evaluation process for all the 42 fields of science.

The selective scientific reporting is performed by certain scientific events and entities, such as: journals, conferences, symposiums. As a matter of fact, these entities point out the various components of the scientific reporting, proceed to index the scientific output into international databases and also integrate them in the main scientific stream of publications. In Romania, according to the requirements of National Education Law 2011, there is the responsibility to publish, periodically, the hierarchy of all universities from the national education system. The results of scientific research of Romanian universities are reflected into a national ranking that quantifies both the quantity and the quality of the scientific output coming from the universities involved in scientific output and dissemination of science.

The methodology of evaluating the Romanian universities on scientific components was developed by a consortium comprising the following entities: ARACIS, The Romanian Agency for Quality Assurance in Higher Education - full member of the European Association for Quality Assurance in Higher Education, CNCS, The National Research Council, UEFISCDI, Executive Agency for Higher Education Research and Innovation Funding and also an international committee with competences in field. This methodology is based

on a questionnaire required for all the Romanian universities that describes as scientometrics indicators the results achieved by the universities´ members in their activity of scientific research and provides the indispensable resources for the activity of scientific research, as well as, the connections between the university and outside environment.

3. Modeling the scientific reporting

Taking into account the informational analysis based on the structured information related to the methodology of evaluating for universities´ ranking, a generic model of a database for the research management of each university which reports data required for evaluating process could be designed. More and more Romanian universities, including the Bucharest Academy of Economic Studies, decide to implement online platforms for collecting directly the research components from the entire university community. After all, these research components on institutional level will represent the scientific output of any university.

All these interdependent elements which define the quality of scientific research on components can be transposed into a conceptual model and, subsequently, into a logical model of a database. In outline, we described a model of a database which integrates all the research components of Romanian universities with the purpose of classifying and supplying a universities´ hierarchy according to both the institutional and human resources involved.

The content of the institutional component assignable to database is materialized into several tables that store the following information: the entities of higher education, their type advanced research, research and education, education and financing type public or privately financing. The human component of research involved in the research management is materialized, in main, into a table that describes the teaching staff, in relation with the institution where the human resource is affiliated and also with the research results.

The exhaustive transposing of the dissemination requirements of research results, individual or of group, into a relational model that provides the integrality of a database conceived for collecting and reporting the scientific output is focused on a table containing “the research results” with which the components of research portfolio inter-relate. These components mean a number of brevets, prototypes, thesis, grants, scientific papers and books. As a matter of fact, the research results are related to the human resource that performs didactic activities and also research work in Romanian universities. Moreover, the research results are affiliated institutionally. Actually, each scientific paper is quantified using a scientometrics indicator belonging to a set of indicators with the idea of storing the scientometrics indicators group for journals, books, conferences and so forth.

We consider that these reporting systems are efficient only on organizational level, meaning a reporting area where the research components are specified using homogeneous terms. The requirements referring to the reporting process of scientific output are, generally, uniform enough on national level. However, on international level, these requirements are heterogeneous, depending on the particularities of science policy from each country or according to the tendency revealed basically on “science market” in different periods of time. Harmonizing these components is rather difficult due the different terms used in scientific reporting, as well as, different weights of research components in scientometrics evaluation, in a period of time or other.

Even on organizational level there are some compatibility troubles arising from the fact that we have different formats of scientific reporting. This heterogeneity of data represents a major constraint into the process of aggregation and centralization by scientific subfields and fields and also by organizational hierarchies, universities, faculties, research institutes. The prominent heterogeneity of scientific data reported to those entities that promote the science policy on national or international level is, on the contrary, quite attenuated on level of independent entities that index the scientific papers in international databases. These indexes based on a unitary description of content and papers´ structure using universal language for presenting the information on Internet, in XML. Unfortunately, this standardization of information perceives just a single

component that is the scientific paper of the portfolio of research results.

Therefore, harmonizing the scientific reporting on any level requires a unitary quantification of scientific reporting components. In terms of compatibility, a possible solution consists in using a universal language for scientific reporting with the purpose of ensuring the compatibility between data of scientific reporting, regardless their type of aggregation, on level of individual researcher, research team, research center, faculty, university, consortium, country, field and so on and also trying of decreasing the differences between the reporting systems of certain scientific results. This solution arises from the system of financial reporting that, based on their heterogeneity, can be quantified and compared with the aid of a "universal" language for financial reporting called XBLR.

4. From financial reporting to scientific reporting through a universal language of reporting

4.1 Research methodology

The research methodology implies, in main, studying of literature in field referring to financial reporting in XBLR. Based on the present research and taking into account the authors´ experience on design, development and implementation of scientometrics reporting in a Romanian university, by means of formalizing the scientific output reporting through databases, the paper´s authors try to analyze the hypothesis according to which these scientific reporting can be achieved using a specific language, called XSRL, based on XBLR language.

The present paper also refers to the method of comparing the XBLR language features with those of the new scientific reporting language and, moreover, verifies conceptually each architectural level which composes the XBLR language and, by analogy, tries of adapting the XBLR architecture to the scientific reporting. Thus, we need to analyze the opportunity of transposing XBLR technology from financial reporting to scientometrics reporting.

4.2 Data standards: from XML to XBLR

In an informational world, ever more various, that changed and developed continuously, more and more research has been materialized in studying the possibility of information systems to exchange data between them, regardless of form, the interoperability of data stored on different IT platforms, Beardsworth, 2010, and support the collaborative and integrated approaches, Hjelt, M. and Bjork, 2007.

The basic standard of data inter-operability on Internet is the XML format. As a meta-language that ensures the efficiency for transferring the data provided by different systems, XML represents a starting point in defining other markup languages. This XML quality as meta-language offers the possibility to present information in a standardized format, but also the opportunity to branch out and develop around fields of interest of becoming more specialized. Basically, the "universal" qualities of XML language in terms of data transfer are specialized in an informational variety searching for standards.

As XML labels define unequivocally the semantically ways that information transfer on the Internet should be structured, similarly, languages derived from XML should structure an information from a field of activity, depending on certain standardized reporting requirements. Given the potential of "universality" of the data transport format, XML allowed of creating some specific data standards, with the punctual applicability at the level of some fields of activity Fenareti Lampathaki, Sotiris Koussouris, George Gionis, Yannis Charalabidis and Dimitris Askounis, 2009: derived from: cXML, xCBL, eBIS-XML, OAGIS, UBL and also XBRL.

But undoubtedly the best known and used language derived from XML family is XBRL representing, in fact, the language of data interoperability from financial reporting.

4.3 XBRL and XSRL

XBLR language was designed by Charles Hoffmann in 1988 and subsequently developed under the name XFRML, eXtensible Financial Reporting Markup Language, and eventually was renamed XBRL, eXtensible Business Reporting Language. Some authors consider that "Hoffman's idea was quickly supported by the American Institute of Certified Public Accountants, AICPA, in developing the first prototype", Phillips, M. and Colvard, R, 2007.

Since 2009, about 500 biggest companies listed in the US use XBRL language for financial reporting. Nowadays, all US-listed companies that use reporting standards based on US GAAP Taxonomies - 2012 -, IFRS Foundation, 2010, but also, more and more European companies that use reporting standards based on IFRS Taxonomies - 2011 convert and map their financial reporting from its own format – specific to each company and country, to standardized format based on XBLR, Miklos A. Vasarhelyi, David Y. Chan, J. P. Krahel, 2012.

As the XBLR language is based on the XML specifications, generally called XLink, similarly, we intend to prove whether the new concept XSLR can accede to scientific taxonomies defined according to the model of financial reporting architecture. The engineering of scientific reporting manipulates terms and aggregations with the purpose of allowing measuring the scientific performances of researchers. Generically, these elements could be equivalent to the bibliometrics, informetrics and scientometrics quantifications.

The taxonomies specific to the financial reporting are public. These taxonomies are extended in view of allowing the development of a hierarchy among which a company could build up a financial reporting using a universal format – XML, Group, 2012. Besides, all the components of the financial reporting are extensible elements that include statements and disclosures, "roles" in XBRL, titles and sub-titles "abstracts" in XBRL, and accounting concepts "elements" in XBRL.

These components can be located on the level of physical addresses and also can be consulted using the specific search engines – yeti, http://bigfoot.corefiling.com/, which allow the access to the libraries with specific taxonomies of each country, on temporal dimensions years for which the taxonomic elements are available, on industries, Banking and Savings, Brokers and Dealers, Commercial and Industrial, Insurance, Real Estate, and so forth.

We consider that each component of scientific output could operate with taxonomies. Once a taxonomy was created around an interest pole, this one might be extended and suited to the needs of an users subgroup, that share common properties, hierarchically subordinated to that pole of interest.

In scientometric, the world of scientific reporting, all actors that provide, report and change between them the scientific components need taxonomies containing enough items to describe the scientific effort of the actors involved in research, Larisa Soldatova, 2007. In such a taxonomy the tags are standardized in order to allow the analysis of scientific output according to certain habits and reporting and quantification policies of scientific results.

Taking into account the XBLR capabilities we can say that, similarly, the dimensions of financial reporting, Hannon, 2005, can be interchanged in XSLR with dimensions of scientometrics quantification, distributed on components of scientific research, scientific papers, books, brevets, grants, conferences, etc., subfields, fields of interest of scientific research, entities participating in scientific output esearch and teams and centers, faculties, universities, consortiums, countries, etc.. Each such component can be extended at the primary fields and subfields of science these components can be interchangeable. Periodically, the public taxonomies available on Internet can be updated, in fact, the old versions of taxonomy will be replaced by the new ones.

XBLR language uses tags to describe and identify each item of data in an electronic document. These tags allow "xSRL engine" to navigate through data and hierarchies, analyze the relationships between them and supply results in multiple formats, compatible with different instances of science policy.

As the taxonomies specific to financial reporting are public, so the taxonomies specific to bibliometrics,

informetrics, scientometrics are public. The aforementioned taxonomies can be located at the level of physical addresses on Internet and consulted by means of specific search engines adapted both fields of scientific reporting and content of this reporting. A great starting point would be Google Academic by which the scientific papers can be indexed and cataloged, as well. However, Google Academic has a major inconvenience: this web search engine cannot include other components of scientific research and moreover, these components cannot be related at all.

4.4. Architecture of taxonomies science reporting - type

A taxonomy for scientific reporting represents an electronic dictionary of science reporting elements used to report the scientific output. This reporting is carried out whether the direct suppliers of science, individual researchers and research teams, entities from which they belongresearch departments, faculties, universities, research institutes, countries, etc. or rapporteurs and disseminators of scientific output, international databases, publishing houses, journals, conferences, etc.. The two categories of actors use the same taxonomies based on the components of scientific output the difference between these categories consists in level of information aggregation. Development of scientific reporting taxonomies taxonomies´ engineering involves defining the following basic components, Heiden, 2007:

- *Abstract type elements*. The abstract is an attribute of an element to indicate that this one is only used in a hierarchy to group related elements together. This component allows creating a basic structure of scientific reporting according to the national and international standards of scientometrics reporting. Besides, an abstract refers to the categories of a portfolio containing a number of "elements" of scientific reporting.
- *Elements* – means XBLR components items, domain members, dimensions, etc.. The representation of a science reporting concepts, including: line items in the face of the scientific reporting statements, important narrative disclosures, scientific fields and subfields.
- *Attribute* - a property of an element including its name, type scientific paper, book chapter, grant, etc., data type and whether the element is abstract.
- *Calculation relationship* - represents additive relationships between numeric items expressed as parent-child hierarchies. Each calculation child has a weight attribute, +1 or -1, based upon its natural balance of the parent and child items. In XBLR the attribute "Weight" gives certain additive or subtractive qualities to the accounts or accounts aggregates where to participate the values of those accounts for defining a post balance sheet. Instead, XSRL needs only attribute "Weight" with a positive sign to gather expression for the values of all components of research. Unlike XBLR language, XSRL needs only the attribute "Weight" with a positive sign to gather the value expression of all research components. In scientific reporting these computing elements could be considered as quantifiable parameters relative score of influence, factor of impact, number of pages per chapter books, number of chapters, books, weighting coefficients of the components of evaluation as concerns the results achieved in scientific research activity, environment, assessing the scientific research environment, acknowledgement of academic community and so on. Each component of scientific reporting can be quantified in value terms and placed in hierarchical relationship additive or subtractive with parent and child branch from taxonomic hierarchy of scientific reporting.

Implementation of the scientific reporting in xSrl consists of analyzing and tagging in a spreadsheet for each detailed component of them. This process is mostly manual and depends on the experience of an expert that simply operates the tagging of scientific components according to the taxonomy of that scientific field. Once this operation is completed, it can develop a tool using Microsoft® Visual Studio.Net and Java® programming language, by which tagged data of spreadsheet is taken over in a uniform and standardized format. In the present case, the tools developed by IBM for XBLR can be well adapted.

5. Findings and future research

The main contribution to the field of scientific reporting consists of developing a taxonomy of scientific reporting, specific of taxonomies´ engineering, from which the components of the XBLR language, abstract, elements, attribute, calculation relationships, weight, and so on, will be complied with the scientometrics reporting language. The extended taxonomies for science allow the national and international universities or entities of science policy to develop a taxonomy in XML format. We consider that all the components of scientometrics reporting are basically the extensible elements that comprise the criteria and standards according to which the universities report their scientific output.

The future research will aim to study the possibility for tagging the scientific reporting of Bucharest Academy of Economic Studies and then provide a tool to standardize this reporting in consortium "Universitaria", which also includes other universities, such as, Cluj-Napoca Babes Bolyai University, Iasi Alexandru Ioan Cuza University and Timisoara West University.

References

Beardsworth, R., 2010. XML standards as the basis for data interoperability among military C2 systems and beyond. *MILITARY COMMUNICATIONS CONFERENCE, 2010 - MILCOM 2010* (pp. 231-236). San Jose, CA: ISSN : 2155-7578.

Fenareti Lampathaki, Sotiris Koussouris, George Gionis, Yannis Charalabidis and Dimitris Askounis. (2009). Cross-DimensionalModelling Patterns to Empower Pan-European Business to Government Services Interoperability. *ON THE MOVE TO MEANINGFUL INTERNET SYSTEMS: OTM 2009 WORKSHOPS* (pp. Volume 5872, 152-161). DOI: 10.1007/978-3-642-05290-3_26.

Group, X. U., 2012. *Best Practice Guidance.* Best Practices Working Group.

Hannon, N., 2005. XBRL Fundamentals. *STRATEGIC FINANCE*, 57-58.

Heiden, J. v., 2007. *XBRL IN Plain English - A SIMPLIFIED VIEW ON XBRL.* Batavia XBRL BV.

Hjelt, M. and Bjork. 2007. End-user attitudes toward EDM use in construction project. *Journal of Computing in Civil Engineering*, Vol. 21 No. 4, pp. 289-300.

IFRS Foundation., 2010. *The IFRS® Taxonomy 2010 Guide.* London EC4M 6XH, United Kingdom.: IFRS Foundation.

Larisa Soldatova, M. L., 2007. An ontology methodology and CISP - the proposed Core Information. *JISC - Technology & Standards Watch*, 8-12.

Miklos A. Vasarhelyi, David Y. Chan, J. P. Krahel. 2012. Consequences of XBRL Standardization on Financial Statement Data. *ournal of Information Systems: Spring 2012*, Vol. 26, No. 1, pp. 155-167.

Phillips, M. and Colvard, R., 2007. The new financial reporting language has arrived. *Tennessee CPA Journal*.