Open Science Platform — Obligation of Publishing in Open Access in the Republic of Serbia

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ABSTRACT: By following the work of the university's community, one can notice the advantages of the networked digital environment that enables the easier and faster access to published texts. Mass communication that does not violate the code of academic integrity, has led to the emergence of a new paradigm: open science. Library and information systems in Serbia already work on the sustainable development of digital repositories by actively participating in projects supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia. The BE-OPEN project, as an Erasmus+ structural project in the field of capacity building in higher education, gathered the largest state universities. Following the adoption of the Open Science Platform, universities are obliged to create their institutional platforms as a precondition for the application of open science principles.

KEYWORDS: Open science, Open access, Digital repository, Open science platform, BE-OPEN

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1 Open Access Practice in Serbia

Library-information systems of the Serbian universities consist of University libraries and a network of academic libraries. For more than a decade, libraries, as members of the system, have advocated open access publishing

and played a key role in maintaining the digital repository infrastructure (zak, 2011). The definition of open access is given by Peter Suber - *Open access literature is digital, online, free of charge, and free of copying and licensing restrictions* (Suber, 2016). Open access provides freedom in exchanging ideas and results of scientific research work to the entire scientific community.

In 2011, as a part of the TEMPUS project "New Library Services at the Universities of the Western Balkans", the universities of Belgrade, Niš and Kragujevac established the PHAIDRA system as a digital repository. The system was taken over from the University of Vienna.[1] Despite of promotions and educations at the mentioned universities, the researchers from the universities did not deposit a great number of facilities. The highest number of digital collections was set by librarians themselves. The more extensive application of PHAIDRA has been obtained by amending the Law on Higher Education,[2] introducing the obligation to deposit defended PhD theses.

Open Science[3]is a principle that promotes and creates free access to scientific knowledge and results of scientific research, without legal, technological or social constraints. Even though the open science is a new term in the academic community, it originates from the end of the 16^{th} and the beginning of the 17^{th} century (David, 2008), when a certain population of people recognized the need for common communication within the same scientific field. This kind of renaissance in science has upstaged the established introvert way of individuals' behavior within the framework of scientific research and began a new "revolution" in academic circles. The result of "sharing" data has led to the increase in "cooperative rivalries" in discovering new knowledge (David, 2008). The results of "sharing" data has led to the increase in "cooperative rivalries" in discovering new knowledge (David, 2004). This social phenomenon has enabled the creation of a large number of easily ac-

[1] PHAIDRA digital repository of the University of Vienna (accessed on 07/26/2018)

[2] By Article 30, paragraph 9 of the Law on Higher Education ("RS Official Gazette", No. 76/2005, 100/2007 - authentic interpretation, 97/2008, 44/2010, 93/2012, 89/2013, 99/2014, 45/2015 - authentic interpretation, 68/2015 and 87/2016) determine that the University is obliged to establish a digital repository in which electronic versions of defended doctoral dissertations are permanently stored, together with the report of the commission for the assessment of the dissertation, the mentor's data and the composition commission and copyright protection data, as well as make all the information available publicly available.

[3] Open science (accessed on 07/26/2018)

cessible data sources and thus facilitated interaction among researchers. The popularity and necessity of monitoring and using all aspects of open science, information access and data sources grow over time (McKiernan, 2016), although it can be said that this concept has not been fully adopted. Today, with the open science, and with the help of electronic communication, we can track all segments of a research process, starting from the methodology of work, through information about the used apparatus and technical means, up to the results of the research. With this sort of "accelerator of knowledge" (Woelfle et al., 2011), the increasing transparency of science is being achieved.

Open science is a wider concept than the open access publishing itself and it is based on several principles:

- Open data obtained from surveys,
- Open source code,
- Open review, scientific communication and methodology,
- Transparent monitoring of the scientific work results for the purpose of further evaluation, using a wide range of indicators, for all types of research results.

In April 2018, the European Commission adopted Open Science Policy Platform Recommendations, outlining eight priorities which encourage its development (Commission, 2017) The emphasis is on open data, their protection and opportunities to be reused (Kanjilal and Das, 2015). It is clear that such a task requires a complex technical infrastructure, compatible with the existing systems and competencies of all participants in the process. The obligation of publishing papers and research results generated in projects funded by the European Union in open access has been adopted by the European Commission in the form of *Guidelines to the Rules on Open Access to Scientific Publications and Open Access to Research data in Horizon 2020* (H20, 2017). Serbian researchers who participated in international projects have deposited their works on various platforms or networks (Zenodo, Research Gate, etc.), because there was no legal regulation which covers this area.

2 Implementation of the BE-OPEN project

The academic community is aware of the need for publishing in an open access. There are individual examples of good practice of some Serbian sci-

entific institutes which have established institutional or thematic repositories for years. The fact that the Republic of Serbia's budget for scientific development cannot be compared with the budget of EU countries was a key motive for finding and developing additional opportunities in the framework of projects financed by European Commission, as well as for taking established solutions. Since the largest universities in Serbia were aware of the fact that this area has to be formally regulated, they have gathered in BE-OPEN[4] (*Boosting Engagement of Serbian Universities in Open Science*) Erasmus+ project (K2 area - capacity building in higher education). Project partners are six state universities, as well as the Ministry of Education, Science and Technological Development of the Republic of Serbia. The project is implemented from October 2016 to October 2019.

The main goal of the project is development of implementation conditions of full principles of open science, which will be realized through the following steps:

- Development of national and institutional legal acts and guidelines (platforms),
- Implementation of institutional digital repositories at all universities in Serbia, as well as the National Portal of Open Science,
- Strengthening individual competencies by organizing seminars, conferences and workshops for all potential users of the repository,
- Integration through the establishment of the National Open Source Portal, which will provide transfer of technology and knowledge from the academic community to industry and general public, and at the same time provide analytical data for the analysis of research results.

In the first year of project implementation, a detailed analysis of the current situation was provided, the reports on the adopted legislation and the current practice of open science in Serbia were published and placed on the project website, within the WP-1 work package.[5]

At the beginning of November 2017, the website of the Open Science Portal was created, which will be the hub of open science in Serbia, available at `http://www.open.ac.rs/`.[6] NaPON - as the National Open Science Portal, will connect all existing and future digital repositories of individual institutions and data from state authorities. It will provide a starting point for all information in the field of open science.

[4] The front page of the BE-OPEN project. (accessed on 07/28/2018)
[5] WP-1 (accessed on 10/20/2018)
[6] National Portal of Open Science. (accessed 10/28/2018)

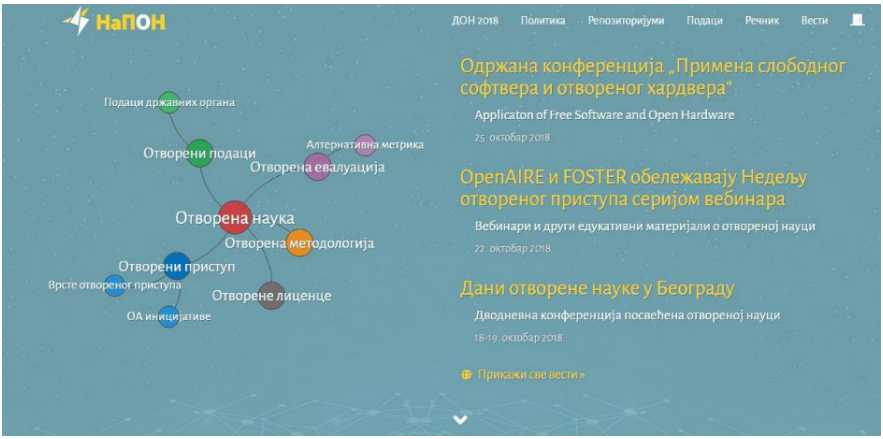

Figure 1. The homepage of the National Open Science Portal

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3 Open Science Platform

In accordance with its goals, on July 9, 2018, the Ministry of Education, Science and Technological Development of the Republic of Serbia, adopted the Open Science Platform (pla, 2017) The Platform is intended for all participants in scientific research activities and refers to the results of research projects and programs completely or partially funded from the budget of the Republic of Serbia. The realization of the open science principles, which will entail the full protection of ethical standards, copyrights of intellectual property, will take place in four directions:

- An open approach to scientific literature,
- Availability of data collected in scientific research,
- Transparency of scientific communication and methodology, and
- Development of digital infrastructure that will enable the realization of the above-stated goals.

The Ministry prescribes the norm that the integral text of published results should be originally in open access, and at the latest 12 months from the date of publishing in the field of natural, medical and technological sciences, or 18 months for research in social sciences and humanities. Immediately after publishing, metadata of scientific publications should be deposited into

an institutional or national repository. The obligation to deposit in repositories will also refer to journal articles, monographs and conference proceedings that are already published in open access. In case that a paper was previously published in a commercial publisher journal (a holder of the copyrights), the terms of the contract signed by the author with the publisher must be respected. It is possible to deposit published version (with the permission of the publisher) and with respect to the embargo period, or the peer-reviewed version that has been accepted for publication. Prior to submitting the manuscripts, it should be useful for authors to check the publishing policy of the chosen journal on the portal SHERPA/RoMEO,[7] which contains unified publishing policies of various journals.

The common scientific publishing practice worldwide is that authors pay the publisher a fee for publishing costs in an open access (*APC - Article Processing Charges or BPC - Book Processing Charges*). In order to meet the needs of an author, it has announced that these costs could be an item in the budget of projects financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

Metadata should always be available to the publicity and unique identifiers of articles and researchers, such as the DOI (*Digital Object Identifier*) and ORCID (*Open Researcher and Contributor ID*), will be standard elements of metadata set. ORCID represents the unique international affiliate-related researcher identifier, which has become an essential element in publishing in numerous foreign journals. A profound and persistent approach of librarians at university and faculty libraries to create complete researcher bibliography, and efforts to link these data to the corresponding ORCID identifiers, will allow the connection of data from a mutual bibliographic database to objects in open access.

Regarding the primary research data, the question of the justification of their archiving was raised. The ability to provide long-term storage in machine-readable formats, and availability within an interoperable digital platform, in order to be used again in other surveys or further research, is a sufficient reason for this venture. After archiving, the degree of data availability is defined. Metadata must always be visible. Future institutional platforms will prescribe the conditions for the deposit of primary data, in accordance with legal or ethical limitations, which will be classified into three groups of availability:

– Closed data,

[7] SHERPA/RoMEO (accessed on 08/02/2018)

– Data available to a defined group of researchers, or
– Fully publicly available.

Adequate treatment of research data consists of several steps, including collection, processing, data analysis by the selected statistical method, defining ways of keeping and allowing reuse by other researchers. Future protection of data will depend on the type of data (for example, whether personal data is included). Data exchange between different research groups in different disciplines can enable the use of such data in new research programs and thus bring savings. Requirements to be findable, accessible, interoperable and reusable are named FAIR principles of research data.

Like the existing university digital repositories in Serbia, the future digital platforms must provide interoperability, which implies the possibility of automatic data downloading in accordance with the international protocol OAI-PMH (Open Archive Initiative Protocol for Metadata Harvesting), and the structured metadata scheme in line with the Dublin Core[8] standard. Until now, repositories for the storage of research data have not been developed in Serbia, so it is recommended by the Ministry that researchers can deposit their data in the appropriate international thematic repositories in the absence of institutional resources.

4 Legal provisions

Machine-readable Creative Commons (CC) licenses[9] will be generally applied to every deposited object. CC licences define the conditions under which research results can be further used. For the full implementation of these provisions, a six-month period was adopted, in which universities and institutes, as independent units, must adopt their institutional platforms for open science. As a part of the final provisions of the Open Science Policy Platform, it has been stated that the Ministry will monitor the compliance of all above-mentioned norms, since the final results will influence the future financing of new projects and other activities under the Ministry's competencies. It remains to be seen which way they will be monitored and whether there will be consequences for disrespecting norms. In the framework of its legal acts (institutional platforms), the institutions will have the obligation to define the level of obligation of publishing in open access, which

[8] Dublin Core metadata initiative. (accessed on 08/02/2018)
[9] CC BY 3.0 RS. (accessed 08/02/2018)

can be verified in different ways, for example, in the evaluation procedure for advancement in academic career. Since the level of commitment has been adopted from the adoption moment of the legislation, the question is to what extent the scientific works will be found in the repositories before the legal obligation. Possible automatic downloading of previously published publications, which were earlier deposited in other repositories, with the download of available data from citation databases and other open archives, will be complemented by the open science corpus in Serbia. There are a large number of scientific research works from Serbia that are already available in open access. Those papers are deposited on numerous portals and aggregators around the world. It is not a rare phenomenon that an authors' affiliation is not seen, or it has not been updated. Additional engagement enables the linking of these works with institutional repositories, which ultimately will have an impact on dissemination of Serbian scientific thought as well as the authors' citation and the overall position of each university on one of the ranking scales.

5 Conclusion

From all mentioned above, it can be concluded that implementation of full principles of open science will contribute to better dissemination and visibility of scientific production, its adequate evaluation and greater utilization of the scientific results. Encouraging research processes, increasing the visibility of results with the possibility that they will be used more than once (Swan, 2016), brings benefits to the general public. Systematic monitoring the results of scientific work, respecting copyright and related rights of publicly available data in use, their evaluation in project decision making etc., will be achieved by adopting numerous unified procedures in work. Considering all these aspects for achieving principles of open science, it is clear that a whole range of technical, legal, organizational elements and time are needed in order to notify the full effects of the application. Certainly, the practice of universities and institutes in Serbia is a proof that that certain awareness about the importance of this process exists. The future infrastructure will bring together all actors in the process of creating scientific results: institutions, researchers, publishers, reviewers, librarians, on the one hand, and financiers and beneficiaries of the scientific community results, on the other (ministry, business entities). It will contribute to more efficient connection between science and economy, and science and the entire society through the development of innovative services and products. Librarians

have an active role in this process: starting from education and assistance in relation to depositing procedures, metadata control, system maintenance, and up to monitoring the implementation of the Open Source Platform. In accordance with the institutional regulations that will be adopted, the role of librarians in academic institutions is and will be crucial in mediating open science processes.

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