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# Open Access Infrastructure for Research in Croatia

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**Abstract.** There is a vibrant Open Access environment in Croatia and several academic and research institutions initiate different activities concerning open access to the scientific information (Ruđer Bošković Institute, School of Medicine, Faculty of Humanities and Social Sciences, Faculty of Mechanical Engineering and Naval Architecture, Faculty of Organization and Informatics at University of Zagreb, University of Zadar, University of Osijek, National and University Library, etc.). It is very important to improve collaboration among different stakeholders, as well as to provide top-down guidance harmonized with EU practices. Important blocks of the existing Open Access research infrastructure are presented in the paper: the Croatian Scientific Bibliography CROSBİ, the Croatian portal for Open Access journals HRČAK, and the common infrastructure for digital academic repositories DABAR. Future development of Open Access infrastructure in Croatia is discussed.

**Keywords:** research infrastructure, open access, repositories, journals, Croatia.

## 1 Introduction

Research in Croatia is mostly conducted at universities and research institutes. There are 7 public (Zagreb, Split, Rijeka, Osijek, Zadar, Dubrovnik and Pula) and 3 private universities, 67 faculties and academies, 2 private and 13 public polytechnics, 26 public research institutes and six technology centres in Croatia (*Researchers' Report 2014 Country Profile: Croatia, 2014*). The biggest and oldest university is University of Zagreb, founded in 1669, and there are according the data provided by the Agency for Science and Higher Education 188.000 student enrolled at all universities and polytechnics. Research in Croatia is carried out through research projects usually governed by three-year contracts. For years research in Croatia was financed by the Croatian Ministry of Science, Education and Sports (MSES). In order to improve its research capacities, the Croatian government made some reforms, and from 2011 the National Science Foundation (NSF) provides the funding for research projects. With this change the number of projects dropped significantly, from 2000 research projects funded by MSES, to 200 project funded by NSF. Also there is a sharp decrease in public R&D funding: from 0.5% of GDP in 2008 to 0.41% of GDP in 2013, even with a shrinking GDP (European Commission, 2015). Further, performance based financ-

ing has been partially introduced to public universities and research. In early 2013, criteria for the establishment of so-called centre of excellence were defined. There are approximately 10.000 researchers in Croatia, and half of them are located at the institutions affiliated with the university.

## 2 Policies supporting Open Access in Croatia

Open Access (OA) was first supported by strategic document Science and Technology Policy adopted by the Government of the Republic of Croatia for the period 2006-2010<sup>1</sup> MSES specified that *“the S&T system, which is financed by public resources, should be open to the public ... and ... results of R&D financed by public resources must be accessible to the public in the form of open publications or databases”*. The most recent version of the National Strategy of education, science and technology published in October 2014<sup>2</sup> is promoting open society even more, open access to the educational materials, open knowledge repositories, and it is specified that *“open access to the research information as the result of public funding will be established”*.

### 2.1 Open Access Declaration

Important initiative came from a group of representatives consisting of university faculty and research staff, librarians and students who created and published a document *Croatian Open Access Declaration* which was presented at a workshop hosted by the Faculty of Electrical Engineering and Computer Science, University of Zagreb, on October 24, 2012 during International Open Access Week. The workshop featured presentations by professors, librarians, computer information technologists, and a student of computer science. The opening speech was given on behalf of the Croatian Ministry of Science, Education and Sports—the central funding body for basic research in Croatia—which has put Open Access to scientific literature on the national agenda.

The Open Access Declaration initiative is pursuing the goal of broadest possible access to digital publication and research data and of long-term availability of digital media and contents. It focusses on eight priority areas: Open Access as public interest, scientific information as national treasure, provision of the results of publicly funded scientific researches, information related to Croatia, Science evaluation research assessment procedures, new licensing models, storage and preservation of data and information, and sustainability of the national infrastructure for open access. The *Declaration* has been signed by 20 state Ministries and other academic and research institutions, as well as by 650 researchers from Croatia and abroad. Declaration advocates OA mandate to publications and research data strongly, and it has been considered

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<sup>1</sup> available at <http://public.mzos.hr/fgs.axd?id=14189>

<sup>2</sup> available at

<https://www.azvo.hr/images/stories/prilozi/Strategija%20obrazovanja%20znanosti%20i%20tehnologije%20Republike%20Hrvatske.docx>

the first step towards mandatory Open Access policies at universities' and research institutes' level.

*„We are inviting the state administration, headed by the ministry responsible for science, as well as scientific and educational institutions, organisations, professional associations, and all the others involved in gathering and publishing scientific information to act decisively and in coordination in order to store all the Croatian scientific information in Open Access form.“* (from the Croatian Open Access Declaration)

## **2.2 Mandates**

The success of this initiative at national level will depend strongly on the existing policies and regulations related to the deposition of publications and research data, especially on the open access mandate policy at national and institutional level. If OA is only recommended, some researchers will deposit their publications and research data, and some will not. It is not only about personal preferences, there are significant differences in OA practices among disciplines too. If the institution wants to store and preserve its intellectual contribution to the human knowledge, the best way is to declare deposition mandatory. It is much easier for an institution if the framework for such a mandate exist on national level, in laws, codes, regulations and rules. By supporting OA to the publicly funded research governments and funders are improving visibility, promoting science and providing benefits to the wider economy of the country. As main funding body for the research projects NSF is supporting Open Access. Beneficiaries of CSF project are obliged to deposit all their publications in OA repositories or OA journals. As for the academic community the mandate for bachelor's, master's and doctoral thesis is stated in the new version of the Law of Science and Higher Education (November 2013), section C, Article 83(11): *“Student graduation thesis must be permanently published at publicly available library web site, and the copy must be deposited in the publicly available repository in the National and University Library”* and 83(12): *“Doctoral thesis must be permanently deposited in the publicly available repository in the National and University Library”*.

The first institutional Open Access mandate was recently adopted by Ruđer Bošković Institute in Zagreb. As of April 17, 2015, all papers produced by Rudjer Boskovic Institute (RBI) researchers must be submitted to the institutional OA repository FULIR. The RBI Open Access is based on the Croatian Open Access Declaration (October 2012), „Recommendation on access to and preservation of scientific information“ by the European Commission (July 2012), and best practices of the prominent research and academic institution across the world.

Publication types include journal articles, conference proceedings papers, book chapters, books and textbooks, graduation theses and dissertations, presentations and posters from conferences, presentations and materials from lectures held at RBI and other institutions, educational materials and technical reports. The final version of the accepted or published paper must be deposited, and Open Access provided in the accordance with the rightholders' provisions. If the rights are partially or totally trans-

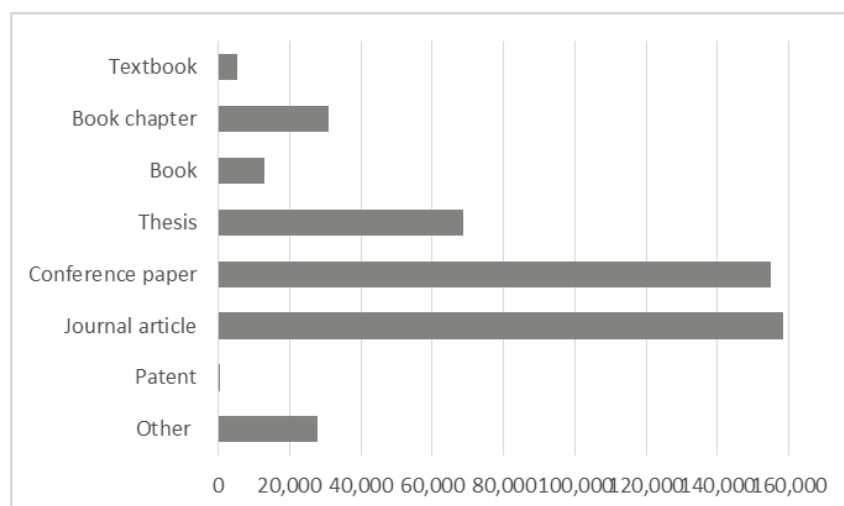
ferred to the publishers, the author is obliged to deposit an eligible version of the paper and provide Open Access to it as soon as possible.

The RBI Library is responsible for the digital repository management, maintenance and development, as well as for the necessary education of researchers regarding the process of deposition. The educational campaign's goal is that every researcher understands their responsibility, and to provide researchers the knowledge necessary for negotiations with publishers. When signing a copyright transfer agreement authors should keep their right to deposit the final version of the paper into the institutional repository and provide Open Access to it. Future agreements with publishers should be modified to allow compliance with the RBI Open Access mandate.

The bottom-up initiatives from different institutions, associations, and groups are numerous and offer a range of information services striving for Open Access. In the next chapters we will describe few of them.

### **3 Croatian Scientific Bibliography – the first OA repository**

First national repository of scholarly papers provided by the Croatian Scientific Bibliography (CROSBI) in 1997 (Stojanovski & Slavic, 1999) is the first OA infrastructure in Croatia. CROSBI predecessor SVIBOR bibliography was designed in 1992 and maintained by former Ministry of Science and Technology (MST) to facilitate research projects' reporting processes. CROSBI was also created to store metadata about publications, but from the very beginning also served as the repository for full-text papers. At the present CROSBI holds information on more than 460.000 publications with more than 30.000 full-text publications deposited. The most represented paper types are journal articles (158.400) and conference papers (155.000) but CROSBI stores a broad range of different formats of scientific output like books (13.100), book chapters (31.100), textbooks (5.500), theses (68.600), patents (650) and others (27.900). (Fig. 1) To provide current information submissions still in the publishing process can also be stored in CROSBI after peer review has been completed and publication accepted.



**Fig. 1.** Distribution of different types of publications in CROSBİ

CROSBİ offers a broad range of searching and browsing possibilities. It can provide publication lists at author, institution, research project, and discipline level. Very detailed bibliographic description for each type of publication is provided, as well as information about citations from Web of Science and Scopus, including altmetrics data.

CROSBİ is developed and maintained by the RBI. The new improved version of CROSBİ is in preparation, and will be launched by the end of 2015. The new CROSBİ will offer faceted searching and browsing interfaces. Also, it will support interoperability at different levels and will provide OpenAIRE compliance.

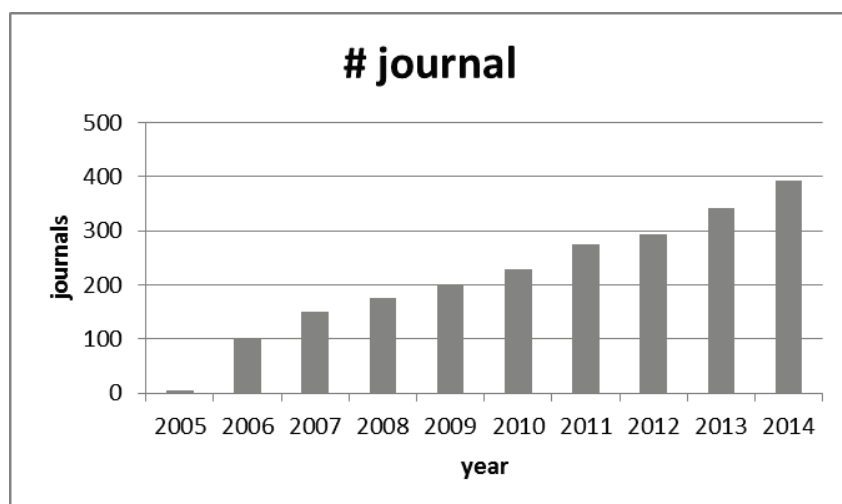
#### **4 HRČAK – Croatian OA journals**

Though a small country, Croatia has a rich publishing tradition and Croatian local journals remain, for many reasons, a mandatory component of local scientific infrastructure and policy (Stojanovski, Petrak, & Macan, 2009). There are many reasons why local journals are important:

- Protect excellence in locally relevant research (Hicks, Wouters, Waltman, de Rijcke, & Rafols, 2015);
- Development of terminology in Croatian language;
- Close editorial guidance of young researchers;
- Development of editorial and publishing skills in a digital environment;
- Bridging the gap between science and its application inside community;
- Benefits for the development of the research and academic culture – considering ethical issues and scientific integrity;
- Building the reputation of the locally scientific community;

- Development of the evaluation criteria, impact of the research is not reflected through citations only;
- Lower cost of publishing concerning high Article Processing Charges (APC);
- Easy access to the research results for the community (OpenA);
- Content in Croatian language can be better communicated inside wide non-academic community – no language barriers.

The best example of “gold route” of the Open Access movement is the Croatian Open Access journals portal HRČAK (“hamster” in English) which serves as a repository for more than 390 scholarly, professional, and popular journals (Fig. 2) and provides access to 130.000 full-text articles. HRČAK was launched to the public in February 2006 with implemented OAI-PMH protocol for information exchange, and today is fully OpenAIRE-compliant. Croatian Ministry of Science, Education and Sports is subsidizing Croatian journals and inclusion in HRČAK as one of the important criteria for journal evaluation. The majority of Croatian OA scholarly, professional, and popular journals are available without embargo and only few journals are Article Processing Charges (APC) based journals.



**Fig. 2.** Number of journals in HRČAK from 2005 to 2014

With OAI-PMH protocol HRČAK papers are distributed among many different repositories, archives, databases and search engines. This approach improves the visibility of the Croatian OA journals (Hebrang Grgić, 2011). The Directory of Open Access Journals (DOAJ) lists about 100 Croatian OA journals.

Not only is HRČAK intended as a portal for current access, it also serves as an archive for ongoing preservation, including journal titles no longer in publication. The HRČAK portal utilizes Open Journal Systems (OJS) publishing and peer-review management backend.

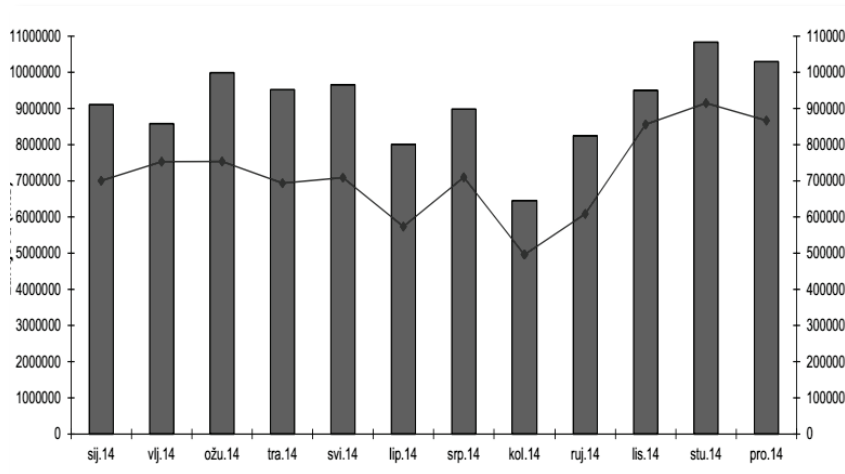


Fig. 3. HRCAK usage in 2014 by month (line – number of hits, bar – number of visits)

With HRČAK as a tool, publishers have a free, simple and fast tool for creating online versions of their journals. Publishers are responsible for the regular upload of full text articles and for input of metadata. Authors can see their articles' visits and downloads statistics. Research and academic institutions get the chance for better dissemination of their research results. Readers, who can be scientists or a wider general public, can easily access the results of publicly funded research without any barriers. HRČAK is very popular in Croatia and abroad which can be seen in the usage statistics (Fig.3). Data exchange protocols disseminate information about the journals and articles to the global scientific community.

## 5 DABAR – common information infrastructure

There is developing OA environment in Croatia and several academic and research institutions initiate different activities concerning Open Access to the scientific information. There are 7 OA institutional repositories, 6 of them listed in Directory of Open Access Repositories (OpenDOAR): FULIR – Full-text repository of the Ruđer Bošković Institute, FAMENA PhD Collection, FOI dIIb, School of Medicine Repository, Faculty of Humanities and Social Sciences Digital Archive, all at the University of Zagreb. Additional two repositories are still in their early stage of development: the University of Zadar and the University of Osijek. The National and University library maintains two active repositories: Croatian Web Archive, a collection of selected material harvested from the Croatian Web space, and Digital Academic Repository, a collection of dissertations and thesis. The Croatian Web Archive's (HAW) mission is to collect, preserve, and make permanently accessible the Croatian web resources as part of Croatia's national heritage. It follows a long-term archiving policy and meets archiving challenges by deploying technical solutions and devising joint solutions in



national and international partnerships. Since its beginning up until 2011, the Croatian Web Archive was used for the purposes of the selective harvesting of the Croatian web resources. That year, in order to complete and improve the national collection of archived web resources, the National and University Library decided to annually harvest the Croatian national domain (.hr) as well as to regularly carry out thematic harvesting projects. The Archive may be publicly accessed on the Internet at <http://haw.nsk.hr>.

There is a lack of technical support and shortage of library staff observed among Croatian academic and research libraries, which is an obstacle also for the existence of long term preservation policies. That was the main reason to ensure that all future efforts are involved in the creation of common national infrastructure which will support all institutions and enable OA institutional repository at every institution.

The initiative to create the common platform for digital repositories for the whole Croatian academic and research community started in March 2014 during the *First Digital Repositories Day* conference. A team of professionals already working with digital repositories, together with the computer experts from the University Computing Department SRCE, was gathered and three working groups were formed: administrative and rights issues, digital objects identification and appropriate metadata description, and software selection. As a result the workflow for master and doctoral theses was defined and metadata schema finished in November 2014. As a platform open source software framework Islandora was chosen, based on Fedora Commons database system, Drupal CMS, and Apache SOLR. This platform has been chosen because of its flexibility, possibility to set up unique identity of the repository, support for different formats, Fedora common warehouse features, etc.

First production of DABAR was officially launched on August 17, 2015. Every academic or research institution in Croatia can easily start to create their own institutional or subject repository using common infrastructure for free. With DABAR every institution will have common place to store all intellectual works in digital format. Common metadata schema will be provided (DC, MODS, etc.), compatibility with European infrastructure, digital curation, and long term preservation. Open access to the content will be promoted, as well as dissemination of the content through high level of interoperability. To provide accuracy of the metadata DABAR is exchanging data with existing information systems, like Information System of the Higher Education (ISVU) using ISVU REST API, and data about authors, mentors, commission members, thesis title, date of defence, document type, education level, etc. are automatically filled in the form. Every document has also persistent identifier URN:NBN (National bibliography number). Every member of the academic and research community in Croatia can use DABAR infrastructure signing in with the unique electronic identity provided by AAI@EduHr authentication and authorization infrastructure. Digital repositories created with common Islandora platform will be OpenAIRE compliant from the very beginning. DABAR infrastructure will support also the joint development of standards, agreements and the distribution of tasks among the infrastructure.

## **6 OA in Croatia and EU**

Although Open Access in Croatia has a long tradition, participation in several international OA projects supported by European Commission was a significant impetus in the OA movement. Croatian institutions participate in different EU-funded projects related to OA and information infrastructure, and different national projects are linked to international activities through fruitful collaborations. For example, as the project coordinator in OpenAIRE Plus and OpenAIRE2020 project, RBI has established collaboration with the representatives of all European countries involved in the project. OpenAIRE is providing useful guidelines to support interoperability for literature repositories, data archives and CRIS. Also FOSTER project helped us to successfully promote Open Science and Open Data across Croatian academic and research community. Numerous presentations and workshops were held during 2014 in all Croatian university cities and RBI, and 600 researchers, librarians and students participated.

Faculty of Humanities and Social Sciences participated in the project SERSCIDA – Support for Establishment of National/Regional Social Sciences Data. SERSCIDA is designed as a strategic project for supporting the cooperation and exchange of knowledge between the EU countries associated within the Council of European Social Sciences Data Archives (CESSDA) and the Western Balkan Countries (WBC) in the field of social science data archiving. The project addressed the issues of potentials of usage of information-communication technologies for the benefits of scientific research and exchange of knowledge.

The results of Croatian participation in different EU projects like Common Language Resources and Technology Infrastructure (CLARIN), a research infrastructure for the social sciences and humanities, Digital Research Infrastructure for the Arts and Humanities (DARIAH) and European Clinical Research Infrastructures Network (ECRIN) must be also included in the national infrastructure.

## **7 Conclusion**

Although Open Access has some support in government's strategic documents, top-down initiatives, which will ensure getting wider support for Open Access, are not present enough. In spite of that, many activities are supporting OA in Croatia, some of them with a very long tradition. Croatian Scientific Bibliography CROSBIB and the Croatian portal for Open Access journals HRČAK are good examples of the successful collaboration among different stakeholders. It is very important to harmonize all activities in Croatia among themselves, and with EC policies and rules. This approach will empower common activities and provide the starting point for the collaboration and interoperability at international level.

At the present only few universities and research institutions in Croatia operate Open Access repositories and contribute to the European repository networks. Common infrastructure DABAR for institutional and subject repositories, which was recently launched, will provide organization, storage and accessibility of scientific in-

formation. More efforts in the future will be done to set up standards related to the curation and long-term preservation.

Ministry of Science, Education and Sports (MSES) could play more active role and enable strategic dialogue on different topics related to the open science, open research data, and open access. Experts from academic and research institutions, libraries and museums, the economic and innovation sector, scholarly publishers, management, and lawyers must be involved in such a dialogue. and define the further development of the infrastructure for scientific information in Croatia. It is very important to use existing information systems (CROSBI, HRČAK, Who's Who in Croatian Science, ŠESTAR – repository of scientific equipment, institutional and subject repositories, and existing databases and digital archives) as the foundations for the future national Current Research Information System (hrCRIS). It is important for Croatian research organisations to continue participation in the EC projects facilitating access to the whole scientific output of the European Research Area like OpenAIRE, PASTEUR4OA, FOSTER, etc.

By maximising access to the research results, we expect to improve their visibility and usage, and aim to increase productivity and impact of research, as well as funding eligibility.

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