



Opening Science with Institutional Repository: A Case Study of Vilnius University Library

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Abstract

The future strategies for opening science have become important to libraries which serve scientific institutions by providing institutional repository infrastructures and services. The Vilnius University Library provides such an infrastructure for the Vilnius University and manages services and infrastructure of the national open access repository eLABa and the national open access data archive MIDAS. As the new platforms of these repositories began operating in the beginning of 2015, new policies and routines for organizing work with scientific publications and data had to be implemented. This meant new roles for the Library and librarians. The University Senate approved the new Regulations of the Library on June 13, 2017, with the task to develop the scholarly communication tools dedicated to sustaining open access to information and open science. Thus, the Vilnius University Library performs the leading role in opening science by providing strategic insights and solutions for the development of services dedicated to researchers, students and the public in Lithuania. As it was not presented properly at the international level before, this article presents the case of the Vilnius University Library, which actively cooperates with other Lithuanian academic institutions, works in creating and coordinating policies, conducts

research on the improvements and services of eLABa and MIDAS, and suggests and implements the integral solutions for opening science.

Key Words: open science; university libraries; national repository; metrics; cooperation

1. Introduction

The Open Access movement imparted new roles upon librarians more than 15 years ago, and by now the functions of these roles are steadily integrated into libraries' working plans.

The Vilnius University is the biggest higher education institution in Lithuania¹ (with more than 20,200 students, 1,330 academic staff members, and 450 researchers²). The Vilnius University Library works on guiding the researchers and administrators about open access rules, methods, licensing and develops the open access national and institutional repositories. All these duties are not novel any more. But they face new challenges with the rise of the new tasks highlighted by the Open Science (OS) approach.

The fundamental objective in various definitions of "open science" is the means of openly sharing and re-using scientific knowledge created by researchers as the result of publicly funded research projects. The FOSTER project defines open science as "the practice of science in such a way that others can collaborate and contribute, where research data, lab notes and other research processes are freely available, under terms that enable reuse, redistribution and reproduction of the research and its underlying data and methods" (FOSTER, 2017). Gezelter (2009) defined four goals: "transparency in experimental methodology, observation, and collection of data; public availability and reusability of scientific data; public accessibility and transparency of scientific communication; and using web-based tools to facilitate scientific collaboration." The ALLEA declaration on the OS signed by all European Academies, including the Lithuanian Academy of Sciences, in April 2012 states that OS "envisages optimal sharing of research results and tools: publications, data, software, and educational resources" and highlights the aspects which should be realized: "open scientific content arising from publicly funded research; open e-infrastructures for public and private research; Open Science culture" (ALLEA, 2012). The importance of "open science culture" is also stressed by the European Commission

in the concept paper “Digital science in Horizon 2020” and should be understood as the intention to change academic assessment and reward systems by creating a culture of sharing and collaboration in open online platforms where the rankings of research results by scientists, engineers and innovators should be integrated and taken into account in assessment procedures (European Commission, 2013). An important part of OS is the technological infrastructure, as The European Commission states in its Digital Single Market Strategy, launched in May 2015. Its plan is to release the European Open Science Cloud by 2020 – a virtual environment services for “*Europe’s 1.7 million researchers and 70 million science professionals to store, share and re-use their data across disciplines and borders*” (European Commission, 2016).

As the OS term is broad and can be understood in various schools of thought (Fecher & Friesike, 2014), in this article the implementation of OS will be discussed as the strategic task for the Vilnius University Library – creating and implementing policies and regulations for open access to scientific publications and data; the means for providing the accessibility and distributing the research results; opening metrics for assessment procedures; and cooperating for implementing effective e-infrastructure. The OS roadmap for the Vilnius University Library can be formulated according to the work done in the Open Access field, the practices in developing the national and institutional open repositories, and the knowledge gained from the surveys with researchers and stakeholders.

2. Library Activities and Challenges in the Implementation of Open Science Ideas: Presenting the Situation

Carlos Moedas, EC Commissioner for Research, Science and Innovation, at the EU Presidency Conference in Amsterdam, on 4 April 2016, said: “As I see it, European success now lies in sharing as soon as possible [...]. The days of Open Science have arrived.” (Moedas, 2016). The era of open science was announced.

The purpose of open science is to ensure the principles of openness for the entire research cycle, from the start of the research to the final stages, and to foster sharing of knowledge and collaboration between scientists. The concept of open science includes: Open Access, Open Data, Open Source, Open Educational Resources, Open metrics, Citizen science, etc. (FOSTER, 2016).

Research can be described as a dynamic, collaborative process, the development of which is largely driven by scientific communication, collaboration and sharing of research results. The ideas of open science date back to the 17th century when the first scientific journal appeared, and scientists discovered ways to collaborate and share scientific ideas, thoughts and results (The Royal Society, 2018). The Open Access movement, prompted by the Budapest, Bethesda and Berlin declarations, was one of the first steps towards Open Science in the modern world.

However, the evolution of open access ideas is much older than the most commonly mentioned date for the acceptance of declarations. Who and when specifically prompted the open access movement, now hardly anyone can answer precisely. Perhaps, as pointed out by Peter Suber (Suber, 2009) it began in 1966 when the U.S. Educational Resources Information Center (ERIC) was established by the Department of Education's Office of Educational Research and Improvement and the National Library of Education. Or maybe in 1966, when the publication of Medline started (but was not free until 1997). Or in 1969, when Advanced Research Projects Agency Network (ARPANET) was established. Or with the Project Gutenberg, which started in 1971. Or maybe by subsequent events? Back in 2000 Southampton University released EPrints, its OAI-compliant software for e-print archiving, and in 2003 started the preparation of the first Open Access policy papers at the Queensland University of Technology. It was stated in the document that the faculty research "is to be" on a deposit in the QUT open-access repository. The policy was approved in the beginning of 2004. This is the first university-level open-access mandate.

The current scope of the Open Access movement is evidenced by the intense development of infrastructure – specifically repositories – and the approval of documents regulating open access in institutions or funding organizations. According to OpenDOAR, there are 3,763 open access repositories registered in the world (OpenDOAR, 2018). The dynamics of repositories are perfectly illustrated by the following figures: in 2005 there were only 89 repositories; in just a little over a decade this number has increased by a factor of 42!

Open access repository mandates and policies are approved by 941 institutions or organizations. Among them are 83 funders, 56 funders and research organizations, 11 multiple research organizations, 716 research organizations (e.g. university or research institution), and 75 sub-units of research organizations (e.g. department, faculty or school) (ROARMAP, 2018).

A study conducted by the European University Association (EUA), which received 338 responses from universities and higher education institutions across 39 European countries, shows that over 50% of surveyed institutions stated that they had implemented an open access policy for research publications, and 21% reported being in the process of developing and implementing an open access policy over the next year. The study also showed that almost 77% of universities had their own repository and about 12% participated in a shared repository. However, the results nosedive in regard to enacted policies for opening of research data: only about 19% of the institutions surveyed had an institutional research data management policy and almost seven out of ten institutions indicated no guidelines for open access to research (Morais & Borrell-Damian, 2018).

The role of libraries, especially academic libraries, is crucial in both the open access movement and the implementation of open science ideas. It should be mentioned that there is a significant contribution by libraries in developing open access repositories, approving open access institutional policies, disseminating information about open access or open education resources, organizing training, consultations, managing technical issues, etc.

Academic libraries, participating in the process of scientific communication, inevitably play an important role in the open access movement, which ensures the dissemination and access of scientific production to the whole scientific community and society (Cullen & Chawner, 2011). Academic libraries, as part of academic institutions, are among the leaders in the open access movement. It has historically been the case that research is one of the most important activities of all academic institutions, and the main task of their libraries is to assist their patrons in conducting studies, research and research activities (Priti, 2012). By pursuing open access activities, academic libraries seek to offer a repository-related suite of services for scholarly repositories, to become activists for changes in the scholarly publishing system, and to support the Open Access movement and ideas (Mercer, 2011). But the open science paradigm greatly extends the library's activities, services and responsibilities, while demanding new innovations, knowledge and competences. Since the very foundation of the first repository, libraries are actively involved in the creation of repositories, their development and maintenance processes (Asunka, Chae, & Natriello, 2011; Bosc & Harnad, 2005; Gumpenberger, 2009; Jones, 2006; Rieh & Smith, 2009). Most institutional repositories are hosted in academic libraries, thus not only ensuring the preservation and dissemination

of scientific production of the institution, but also the possibility for librarians to cooperate closely with the participants of the scientific process, scientists and researchers (Priti, 2012). Institutional repositories have become a centralized library service, an institutional platform to “publish and showcase the full breadth of an institution’s scholarship;” including articles, books, theses, dissertations, journals, images, videos, audio, and other media (Bankier & Gleason, 2014).

Open research data is an important component of open science. Opening, using, sharing and managing data are challenges faced by academics or research institutions that carry out research. The largest data repository registre *re3Data* states that there are currently 2140 data archives (as of 1 January 2018). As academic libraries traditionally play an important role in ensuring access to academic results, the role of libraries in research data management processes is undeniable and important (Tenopir, et al., 2017). The main strength of the libraries is that they offer a stable environment and bring together knowledge and services that enable the use of digital infrastructures and further its development. Libraries are concerned with the expansion of digital collections and the development of infrastructures for research data. Libraries play a key role in coordinating the implementation of data management policies and procedures in institutions, in close cooperation with other institutional units (e.g. science administrators, IT staff, lawyers, etc.). The libraries in these activities are involved at the institutional, national and international levels, for example through the Research Data Alliance, etc. (LIBER, 2015). When initially providing research data management services, libraries focused towards services related to research data management and curation; they provided infrastructure for data storage and curation, and participated in research and grant proposal teams as data curation consultants. However, these services were provided in a limited and inactive manner. In 2011 a survey of 221 libraries found that both information/consulting services and technical services were carried out in a minority of libraries. Most of the surveyed libraries replied that they did not plan to do this in the future. (Tenopir, Birch, & Allard, 2012). After repeating the study a few years later, the results showed that the situation did not change much, although the number of libraries planning to provide these services increased (Tenopir, et al., 2015). Meanwhile, in 2016 the research in European scientific libraries has shown that most libraries are already offering or planning to offer the following services in the future: consulting or information services such as helping to find information on data management plans, metadata and data standards, and,

to a lesser extent, technical services such as entering data into the repository and the like. In addition, libraries are actively involved in the planning or development of MTD policies (Tenopir, et al., 2017). Currently, the main players involved in providing research data management services are data archivists, data curators, data librarians, data analysts, data engineers, and data journalists. However, there is a clear need for higher-level specialists –data scientists. In future, libraries should have data-savvy librarians who have knowledge of datasets, understand technical issues and techniques, and have multi-disciplinary competences. Moreover, some of them should have technical data mining and analysis skills that allow them to work with data, to automate workflow and to be fully integrated into research teams (Burton, Lyon, Erdmann, & Tijerina, 2017).

The activity of academic libraries can also be seen in other actions related to open science. Leadership positions are held by libraries in institutional OER programmes and initiatives. Librarians use their skills or competencies to support, promote, and even cultivate and create Open Educational Resources (Okamoto, 2013; Salem, 2017). Lately, a number of libraries have been involved in the development of Citizen Science projects and are helping to bring together citizen scientists and researchers (Cohen, et al., 2015).

3. The Policies and Regulations for OS

Scientists in Lithuania had contradictory views towards the Open Access (OA) movement in 2008 and strongly denied that it could lead to a success. But these views and talks were a progressive start for openness in scholarly communication in Lithuania because the active discussions were initiated together with the Ministry of Education and Science, the Association of Lithuanian Academic Libraries and the Lithuanian Rectors' Conference. In that context the feasibility study for the development of a national OA repository was published (Kupriene & Glosiene, 2008) and the discussions on planning the budget for the implementation of such a repository started. On April 30, 2009, Article 45 was included in the Law on Higher Education and Research;³ it required that the results of all research work carried out in state higher education and research institutions must be communicated to the public (Kupriene, 2010; Kupriene & Petrauskienė, 2009; Schmidt & Kuchma, 2012, pp. 83–84). After a few changes of this Law the same requirement is still valid and it is an important reason for the OS implementation: *“In order to*

ensure the quality of research conducted with funds of the state budget, the transparency of the use of funds of the state budget, to enhance scientific progress, the results of all research and experimental development works carried out in higher education and research institutions and funded by the state budget must be announced publicly (in the website or any other way), to the extent this is in compliance with the legal acts regulating the protection of intellectual property, commercial or state and official secrets” (Lietuvos Respublikos mokslo ir studijų įstatymas, 2017).

The other important regulation comes from The Research Council of Lithuania. The Guidelines for Open Access to Research Results were adopted on February 29, 2016; they include OA and open research data policy. The requirements for publications contain: must be stored in repositories and archived; shall be deposited immediately after they are accepted for publishing; may be subject to an embargo period of 6 months (12 months in humanities and social sciences); the expenses related to the opening of publications in hybrid journals cannot be considered eligible expenses; if processing charges have been paid, must be published with a CC-BY license. The requirements for opening data are included too: the data must be preserved for a period not shorter than 5 years following the completion of the project; a data management plan must be included in the project proposal; the expenses incurred during the project to implement the data management plan are eligible expenses; the data underlying the scientific publications must be made openly accessible at the same time as the publication (may be exempted from the provisions). The Research Council of Lithuania reserved the right to suspend the funding of the project in case the project leader and/or the institution fails to comply with the requirements of the Guidelines, and it established the transitional period for the implementation of the Guidelines by December 31, 2020 (in case of any infringements, only warnings will be applied) (Research Council of Lithuania, 2016). The Guidelines are implemented by the project proposal application forms, approved by the Ministry of Education and Science, with requirements for describing what kind of data and research results will be created in the project, where these data and research results will be published and deposited, and how it could be accessed and reused after the project completion (Ministry of Education and Science, 2017a,b).

On October 8, 2009, the Regulations of Open Access to Vilnius University Scientific Works and the Results of Scientific Research prepared by the Vilnius University Library were approved by a Vilnius University Senate’s decree. Following these Regulations, researchers, scientists, lecturers, science

workers, science auxiliary personnel and other members of VU community who work at Vilnius University have to insert their scientific articles published in peer-reviewed scientific journals, and any other scientific production in the electronic repository of the Vilnius University. In addition scientific journals financed by the University budget must be included in the Directory of Open Access Journals.

In 2014, together with the Ministry of Education and Science and the Consortium of Lithuanian Academic Electronic Library, the Vilnius University Library developed the new version of the national open access repository in eLABa (Lithuanian Academic Electronic Library) information system. On September 22, 2014, the Ministry of Education and Science signed the order No.V-838 and established eLABa as the national information system with the aim to centrally manage the documents and the results of research activities of the participants in the Lithuanian science and studies system necessary for the research, experimental (social, cultural) development and studies. The main goals of eLABa were determined – to automate the processes of collection, processing and provision of research and study documents, and to automatically record the results of scientific activities of the Lithuanian science and study system's participants. The Ministry of Education and Science acts as the owner of eLABa, the Vilnius University – as the main manager, and the Library according to Vilnius University Rector's decree executes the main manager's functions and responsibilities at the national and institutional level (Ministry of Education and Science, 2014).

As the eLABa e-infrastructure started to run and provide services for users, Lithuanian academic institutions agreed on common rules for the deposition of electronic documents in eLABa. These rules were approved on January 16, 2015 at a national level and they provided the template for adoption of the same regulations and requirements at the institutional level (eLABa Rules, 2015). On March 31, 2015, the Vilnius University Rector approved the institutional rules and regulations for the deposition of electronic documents to eLABa, which noted that all University researchers' scientific publications, doctoral dissertations and their summaries must be registered in eLABa, which serves as the institutional repository of the Vilnius University (Vilnius University Library, 2015b).

In 2011 Vilnius University started to develop the National Open Access Research Data Archive MIDAS, with the aim to increase the dissemination

and accessibility of research data by means of information technology. The main goals of MIDAS were determined – to centrally manage research data, personal data and other research-related information, and to provide through an integrated access portal an opportunity for computer assisted search, provision of information and analysis of scientific research data. Vilnius University acts as the owner and the main manager of MIDAS at a national level (MIDAS, 2015; Vilniaus Universitetas, 2013). The Library executes the coordinator's role and is responsible for raising awareness, the guidelines, and curating the processes of depositing data and providing access.

The Rules and Regulations for the Deposition of Research Data to MIDAS were adopted in the Vilnius University in 2015. On April 18, 2016, the Guidelines on Research Data Management were approved by a Senate's decree with requirements for Vilnius University researchers to be responsible for creating and implementing research data management plans, selecting and depositing data to MIDAS, and documenting them, while subdivisions of the Vilnius University, including the Library, being obliged to ensure all the necessary assistance. The renewed Rules and Regulations for the Handling of Research Data in MIDAS were adopted on April 28, 2017, by a Rector's decree which invites every Lithuanian researcher to deposit and publish openly his research data (Vilnius University Library, 2017).

By working on those policies, the Vilnius University Library created a good regulatory basis for working in and for developing or creating new necessary services for ensuring the openness of science. Main regulations for publications, electronic theses and dissertations, and for data are summarized in Table 1.

To assure the OA implementation, the Vilnius University Library services and roles include: leading the eLABa repository development at the national and institutional level; approving the registered publications in eLABa; ensuring metadata quality in eLABa; revising and updating the Vilnius University Policy on Open Access and Research Data Management; identifying researchers' needs for scientific publications and data services; coordinating and communicating publications and data services; offering support in registering, distributing and preparing reports on scientific publications and creating data management plans; organizing training, revising and updating (if needed) the Vilnius University OS policy documents.

Table 1: Summary of the regulations for open access at Vilnius University.

Publications	Electronic theses and dissertations	Data
<ul style="list-style-type: none"> – Prints or postprints are allowed to be deposited – Must be deposited to eLABa not later than 60 days after the publication date – May be subject to an embargo period of 12 months, unless otherwise required by the publisher – If documents cannot be publicly available without violating rights or legitimate interests of others, files are only described with metadata but not deposited – Author’s addendum to publication agreement is recommended 	<ul style="list-style-type: none"> – Must be deposited in eLABa not later than 14 days after the defense date – May be subject to an embargo period of 36 months to doctoral dissertations and 60 months to final thesis (however, Vilnius University uses a different system for all final theses: VU ETD) 	<ul style="list-style-type: none"> – Data management plans must be created and implemented – Data must be deposited in MIDAS, unless otherwise required by the funder – Required to be open data

4. Providing Accessibility and Distributing the Research Results

The beginning for opening the information about the research results of the Vilnius University is related to the Electronic Database of Scientific Publications of Vilnius University (VU PDB), which was started by the Vilnius University Library in 2001. In 2003, all bibliographic records of Vilnius University researchers’ scientific publications published in 1998–2000 were moved from the system of the Department of Science and Innovation of the Vilnius University. Thus, the VU PDB provided bibliographical information on publications published by University researchers, students and other employees since 1998 (Vilnius University Library, 2014). Until 2015, VU PDB was a database of more than 54,000 bibliographic records of books (monographs, textbooks, etc.), scientific articles, conference reports, patents and other documents (Vilnius University Library, 2015a). There were quite a few records that had electronic links to the entire text, if the publication was

available online for free, or the library subscribed to the database containing a specific publication.

From 2003 until 2015 there were 4995 electronic theses and dissertations collected in the VU electronic theses and dissertations database (VU ETD), 97 per cent of which were openly accessible to everyone (Lithuanian Academic Library Network, 2017).

In the beginning of 2015 all the VU PDB and VU ETD metadata and the full-text files were moved to the new eLABa repository e-infrastructure, which was improved with the flexible functionality and services for researchers to register their research work or publications and upload the full-text papers themselves. Of course, it increased the openness of research results. On July 1, 2017, there were 61,282 Vilnius University's research results registered in eLABa, 16 per cent of which had full-text files and were openly accessible (5884 ETD documents, 975 scientific publications).⁴

All eLABa publications' metadata and full-text files (if openly accessible) are available via the Library's discovery and delivery portal vu.lvb.lt. The eLABa publications' metadata are harvested by the OpenAIRE e-infrastructure and can be accessed through the OpenAIRE Search tool (OpenAIRE, 2017).

The research data collection in MIDAS started in the middle of 2015 and on July 1, 2017 there were 85 data sets, 27 of which were openly accessible and 58 were available on the intranet.⁵

In April and May 2017 the Vilnius University Library conducted a research⁶ on the interoperability of institutional repositories in scholarly communication and interviewed Vilnius University researchers to learn what the routine in communicating Vilnius University's science is. The researchers were asked to tell about how they distribute their research results and data. The interviews showed that Vilnius University researchers understand eLABa as the registry of all research work, as the repository where they can find everything done by themselves or colleagues in Lithuania. They register publications, conference papers and other research results and upload files into eLABa, as is required by the University regulations and for the purpose of assessment procedures, because data on research results for assessment procedures at institutional and national level are taken from eLABa. For the distribution and sharing purposes, however, they were accustomed to use social

networking – researchers upload their publications mostly to ResearchGate, others to Academia.edu, the ORCID portal, Google Scholar profile, their personal websites, SlideShare, or Social Science Research Network; some use Facebook. They chose those portals because eLABa is not indexed by Google, because there are no possibilities in eLABa for flexible and easy sharing of metadata – eLABa is not integrated with international portals and databases. The interviews with researchers showed that for sharing purposes eLABa should be improved. Firstly it should be indexed by Google and should have flexible tools for sharing metadata with harvesters and aggregators. Secondly, as researchers register themselves for an ORCID ID, which is widely used by publishers, indexes and harvesters, the ORCID ID should be integrated into eLABa (Kupriene, et al., 2017).

When asked about sharing data, only a few researchers said they use MIDAS and others said they know a little about MIDAS. Most of Vilnius University researchers share data files only with research team members and usually send data files via e-mails and Dropbox (Petrauskienė & Kupriene, 2017). It means that the Library should prepare a multilayered plan for awareness rising of MIDAS and the data management process. As the rules and regulations for data management and access are not strict in Lithuania, the culture and motivation for researchers to manage data should be created.

5. Opening Metrics and Assessment Procedures

The scientific activity assessment procedures are regulated by the Ministry of Education and Science and organized by the Research Council of Lithuania. The assessment of scientific publications is mainly based on the impact factors, aggregate impact factor indexes, science citation indexes, provided by databases *Clarivate Analytics Web of Science* and *Scopus*. No other indexing or other metrics are included into the assessment regulation, except the number of publications by author or by institution in some particular period of time (Ministry of Education and Science, 2015, 2017a,b).

Lithuanian scientific institutions also provide data about scientific publications and their authors for monitoring and analysis purposes to the Research and Higher Education Monitoring and Analysis Centre (MOSTA), Agency for Science, Innovation and Technology (MITA), and Centre of Information Technologies in Education (ITC). eLABa is the main authoritative channel

for providing data about scientific publications and other results of scientific projects of all Lithuanian scientific institutions. But there is still no developed integration between eLABa and the Research Councils' of Lithuania, MOSTA, MITA and ITC systems. All Lithuanian science institutions are able to download data files with statistics, reports or metadata from eLABa and then send them for assessment procedures. It became obvious that this is not the most convenient way, since it takes a lot of time. Thus, Vilnius University Library suggested the idea to develop the integration between those systems. From September 2016 the Vilnius University Library initiated the discussions with representatives of the Research Councils of Lithuania, MOSTA, MITA and ITC to agree on interoperability of all those information systems (Kupriene, et al., 2017). The idea was well-received, but the debaters agreed there should be more work done on specifying the integration level and data flows.

The interviews with Vilnius University scientists showed that it is important for them to also see the metrics of impact factors, aggregate impact factor indexes and science citation indexes, provided by databases *Clarivate Analytics Web of Science* and *Scopus*. Researchers also mentioned the need for data from the Research Council of Lithuania and the University's information systems about research projects, co-authors and funding (Kupriene, et al., 2017). For example, eLABa could automatically get the data from the Research Council of Lithuania about the programme, the project, the collaborators, funding, and sponsors when the Council signs the agreement for funding of the project. This data can now manually be written in eLABa by the researcher. The statistical and analytical information generated from this data is of interest to researchers and assessors, thus, could be openly available and included into the assessment procedures. The eLABa repository could provide the tools to generate these metrics and ensure flexible and open interfaces for accessing, reviewing and sharing.

The open metrics issue was mentioned in the draft report *Next Generation Repositories*, announced on February 7, 2017 (COAR, 2017), and later discussed in the COAR Annual meeting in May 2017 by Alberto Cabezas from La Referencia. There are lots of and very different portals and databases that collect metrics on research outcomes and it would be perfect to get the common view of all metrics from all those channels. As Vilnius University researchers use the ResearchGate, Academia.edu, ORCID portal, Google Scholar profile, SlideShare, Social Science Research Network to get statistical and analytical

information about downloads, reads, and citations of their publications, it should be included in eLABa's development plans to integrate applications or tools for getting metrics data from various social networking platforms.

6. Cooperating for Open Science e-Infrastructure

Joint activities of Lithuanian academic libraries firmly began in 1997, when the Lithuanian University Rectors' Conference, Lithuanian Academic Libraries Directors' Association (LABA) and the Ministry of Education and Science of Lithuania together with Kaunas University of Technology initiated the project Lithuanian Academic Library Network (LABT). The main purpose then was to consolidate funding and to create a common academic virtual library with automated library workflows, unified search and delivery services. LABT linked together libraries of 16 universities, 18 colleges, 39 research institutions and The Library of the Lithuanian Academy of Sciences. *Aleph* (Ex Libris Ltd.) library automation software was adopted and implemented in all LABT member libraries (Targamadžė, 2005).

After a few years, the Lithuanian academic libraries started to think about creating full-text databases for registering and providing access to scientific publications and electronic theses and dissertations. The VU PDB and VU ETD were created then, but the software did not fulfill the functional requirements of librarians, researchers, and students. It became evident that the efforts for creating and developing common e-infrastructure for all Lithuanian academic libraries must be shared. Thus, on the March 26, 2010, the eLABa Consortium was established as the result of agreement between Lithuanian University Rectors' Conference and the Ministry of Education and Science. The joint agreement was signed by the authorities of 31 Lithuanian institutions; the general meetings of Consortium confirmed Vilnius University as a Consortium administering institution for the period of 2010–2015 (Kuprienė, 2015). The agreement to establish two technical centers and to work together for the development of national eLABa e-infrastructure was signed by the Rectors of Vilnius University and Kaunas Technology University, too. Vilnius University Library performed the Consortium's administering institution functions till 2015 (eLABa, 2017a).

From 2016 to 2017 the Vytautas Magnus University acts as the Consortium administering institution; the Consortium has 50 members (eLABa, 2017b).

The implementation of the project Development of the Integrated Services for the Electronic Information System eLABa has been completed in 2014. The Vilnius University Library cooperated closely with the Vilnius University Centre of Information Technology Development, the Vilnius University E-Learning and Examination Centre, Kaunas Technology University, and the private company “Asseco Lithuania” to create a new eLABa e-infrastructure. The new infrastructure for repository and the new software for uploading metadata and full-text files of research and study results were created and implemented; the subsystem for generating statistics and reports was improved; the Vilnius University’s Electronic Plagiarism Detection System was improved for multi-institutional use and integrated into eLABa; the new repository was integrated with information discovery and delivery engine Primo (Ex Libris); the new logo and webpage www.elaba.lt was created. All new modules from the beginning of 2015 were available to all eLABa Consortium institutions (eLABa projektai, 2015; Kupriene, 2015; Vilnius University Library, 2015a).

The Vilnius University Library organized active discussions and on April 29, 2015, the eLABa Consortium agreed on a Strategic Activity Plan for 2015–2020. The mission was to combine organizational, technical, technological and financial potential, and professional knowledge and skills for ensuring a long-term cooperation and funding for supporting and developing measures for the implementation of the eLABa e-infrastructure. Three operational priorities were identified: Open Access; Development of electronic resources; Cooperation and partnership (eLABa Consortium, 2015). According to that plan Vilnius University Library prepared the proposal for the project for the eLABa repository functional improvements and presented it to the eLABa Consortium on December 21, 2016. The interoperability implementation with Research Councils of Lithuania, MOSTA, MITA and ITC information systems and registries, with databases *Clarivate Analysis Web of Science* and *Scopus*, with social networks, with persistent identifiers ORCID, DOI, with SherpaRomeo and Creative Commons were suggested.

The proposal was accepted as suitable, but further discussions were not initiated by the Consortium administering institution. The eLABa Consortium faces the organizational and financial challenges now; from the beginning of cooperative work in 2015 disagreements on requirements and priorities for improving eLABa arose. As the biggest Lithuanian universities work in the

competitive conditions because of the higher education reform, initiated by the Ministry of Education and Science (with plans to integrate universities) (Ministry of Education and Science, 2017c), there is more difficulty in finding a common roadmap for the development. The main reason is resources – funding for maintaining and developing eLABa comes from the Ministry of Education and Science and from the Consortium members, who are interested to implement their specific institutional needs and have ambitions to manage the eLABa projects in the future. Therefore, the common e-infrastructure is effective if seen from the technological and managerial approach, but it is problematic when every institution wants to have institutional functionality or additional applications. It is expected to go for new agreements for cooperation in Autumn 2017.

The cooperation at the international level becomes very important after the new Regulations of the Library were approved by the University Senate on June 13, 2017. The task “to develop the scholarly communication tools for sustaining open access to information and open science” is the priority for finding interoperable solutions at global infrastructure (Vilnius University Senate, 2017). It is planned to identify tasks for eLABa as the Vilnius University institutional repository according to COAR, LIBER, OpenAIRE, the European Open Science Cloud recommendations and to create the action plan for the international cooperation and integration from 2018.

7. Conclusions

Academic libraries play an important role in the pursuit of opening science, from the beginning of the Open Access movement to the present day. It should be emphasized that there is a significant contribution from the library to developing open access repositories, approving Open Access institutional policies, disseminating information about Open Access or Open Educational Resources, organizing training, consulting, managing technical issues etc.

The case of the Vilnius University Library resumes the policies for Open Science in Lithuania and Vilnius University and identifies that there is an existing political context with positively defined regulations for action in opening science with institutional repository. The experiences at Vilnius

University Library suggest that close discussions with University's researchers are the main condition for determining the roadmaps and identifying priorities for institutional repository development and improvement. Library staff do not participate in all scholarly communication processes and may not know the important requirements for researchers from stakeholders and funders. Librarians may not know the social networking practices and tools used by researchers for depositing, sharing, distributing, and accessing the research results and data. Especially it is important to discuss data management with scientists, to raise awareness, and to create new consultation services. As the success of registration of scientific publications suggests, librarians should be proactive and provide services for depositing data (e.g. for getting data from the scientists and depositing them to MIDAS), creating metadata about data sets, defining the access to them and working on creating the easy and convenient sharing practices.

The infrastructure for opening science is very important. The priority for the next year goes to the cooperation with institutions, which do assessment of scientific activities. For example, eLABa collects all data about scientific publications created by Lithuanian researchers, whereas the system of the Research Council of Lithuania accumulates data about funding projects for those publications and about quality of those publications. The integration of eLABa and information systems of those institutions could help sharing data for metrics and assessment; it could be a start for creating open metrics culture in Lithuania.

The interviews with researchers helped to determine the key tasks for better sharing and distributing the research results of the Vilnius University. The eLABa infrastructure must be improved – it should be indexed by Google; it should have flexible tools for sharing metadata with harvesters and aggregators; the ORCID ID should be integrated into eLABa.

The cooperation of Vilnius University Library on national and international level is very important for developing those services and new ones for opening the science of Vilnius University. The new agreements should be made in the eLABa Consortium and with the Ministry of Education and Science in order to determine the responsibilities at the national level, to agree on the eLABa development directions.

References

- ALLEA. (2012). *Open science for the 21st century, a declaration of ALL European academies*. Retrieved May 19, 2017, from http://www.allea.org/wp-content/uploads/2015/09/OpenScience-Rome-Declaration-final_web.pdf.
- Asunka, S., Chae, H., & Natriello G. (2011). Towards an understanding of the use of an institutional repository with integrated social networking tools: a case study of pocket knowledge. *Library & Information Science Research*, 33(1), 80–88. <https://doi.org/10.1016/j.lisr.2010.04.006>.
- Bankier, J. G., & Gleason, K. (2014). *Institutional repository software comparison*. Retrieved August 30, 2018 from <http://unesdoc.unesco.org/images/0022/002271/227115E.pdf>.
- Bosc, H., & Harnad, S. (2005). In a paperless world a new role for academic libraries: providing open access. *Learning Publishing*, 18(2), 95–99. Retrieved August 30, 2018, from <https://onlinelibrary.wiley.com/doi/epdf/10.1087/0953151053585028>.
- Burton, M., Lyon, L., Erdmann, C., & Tijerina, B. (2017). *Shifting to data savvy: the future of data science in libraries*. Retrieved August 31, 2018, from <http://d-scholarship.pitt.edu/33891/1/Shifting%20to%20Data%20Savvy.pdf>.
- COAR. (2017). *Next generation repositories*. Draft for public comments, February 7, 2017. Retrieved May 13, 2017, from <https://www.coar-repositories.org/files/COAR-Next-Generation-Repositories-February-7-2017.pdf>.
- Cohen, C. M., Cheney, L., Duong, K., Lea, B., & Pettway Unno, Z. (2015). Identifying opportunities in citizen science for academic libraries. *Issues in science and technology librarianship*. In *Issues in Science and Technology Librarianship*. Retrieved August 30, 2018, from <http://www.istl.org/15-winter/article1.html>.
- Cullen, R., & Chawner, B. (2011). Institutional repositories, open access, and scholarly communication: a study of conflicting paradigms. *Journal of Academic Librarianship*, 37(6), 460–470. <https://doi.org/10.1016/j.acalib.2011.07.002>.
- eLABa. (2017a). *eLABa consortium*. Retrieved September 17, 2018, from <https://www.elaba.lt/elaba-portal/en/konsorciumas>.
- eLABa. (2017b). *eLABa institutions*. Retrieved June 2, 2017, from <https://www.elaba.lt/elaba-portal/en/elaba/institucijos>.
- eLABa Consortium. (2015). *Strategic activity plan for 2015–2020*. Approved by the General Meeting of Members of eLABa Consortium on 29 April 2015 [unpublished].
- eLABa projektai. (2015). *Projektai: eLABa integralių paslaugų sukūrimas ir plėtra*. Retrieved June 2, 2017, from <https://www.elaba.lt/elaba-portal/konsorciumas/projektai>.

- eLABa Rules. (2015). *Rules: Dokumentų įkėlimo į eLABa tvarka*. Retrieved May 20, 2017, from https://www.elaba.lt/elaba-portal/documents/19/21849/20150119_VU_isakymas_eLABa_tvakos_aprasas.pdf/66356e3a-8702-43f1-a081-0b726250d043.
- European Commission. (2013). *Digital science in Horizon 2020*. Retrieved May 19, 2017, from http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=2124.
- European Commission. (2016). *Digital single market: the European Cloud Initiative*. Retrieved May 19, 2017, from <https://ec.europa.eu/digital-single-market/en/%20european-cloud-initiative>.
- Fecher, B., & Friesike, S. (2014). Open science: one term, five schools of thought. In S. Bartling & S. Friesike (Eds.), *Opening science* (pp. 17–47). Cham: Springer. https://doi.org/10.1007/978-3-319-00026-8_2.
- FOSTER. (2016). *What is open science? Introduction*. Retrieved August 27, 2018, from <https://www.fosteropenscience.eu/content/what-open-science-introduction>.
- FOSTER. (2017). *Open science definition*. Retrieved May 19, 2017, from <https://www.fosteropenscience.eu/foster-taxonomy/open-science-definition>.
- Gezelter, J. D. (2009). What, exactly, is open science? *The OpenScience project*. Retrieved May 19, 2017, from <http://openscience.org/what-exactly-is-open-science/>.
- Gumpenberger, C. (2009). *The EPrints story: southampton as the cradle of institutional self-archiving*. Retrieved August 30, 2018, from https://www.researchgate.net/publication/277875419_The_EPrints_story_Southampton_as_the_cradle_of_institutional_self-archiving.
- Jones, R. (2006). Institutional repositories. In K. Garnes, A. Landøy & A. Repanovici (Eds.), *Aspects of the digital library* (pp. 111–126). Fyllingsdalen, Norway: Alvheim & Eide Akademisk Forlag. Retrieved August 30, 2018, from <http://hdl.handle.net/1956/1829>.
- Kupriene, J. (2010). Atviros prieigos prie Lietuvos mokslinių publikacijų problemos ir galimybės/Problems and possibilities of Open Access to Lithuanian scientific publications. *Aukštojo mokslo kokybė/The Quality of Higher Education*, 7, 226–247. Retrieved May 18, 2017, from <https://eltpykla.vdu.lt/1/721>.
- Kupriene, J. (2015). Mokslo ir studijų darbų talpyklos funkcionalumo aprėptis: eLABa atvejis. *Vilniaus universiteto bibliotekos metraštis, 2015*, 45–68. Retrieved May 18, 2017, from <https://biblioteka.vu.lt/publikacijos/VU-bibliotekos-metrastis-2015.pdf>.
- Kupriene, J., & Glosiene, A. (2008). *eLABa plėtos galimybių studija*. Retrieved May 18, 2017, from http://vddb.library.lt/fedora/get/LT-eLABa-0001:B.03~2008.SEQN_LABT-001/DS.001.0.01.BOOK.
- Kupriene, J., & Petrauskienė, Z. (2009). Open access to scientific publications: the situation in Lithuania. *Scienscominfo*, 5(2), 1–4. Retrieved May 19, 2017, from <http://journals.lub.lu.se/index.php/sciecominfo/article/viewFile/1625/1315>.

- Kupriene, J., Prokopcik, M., & Petrauskienė, Z. (2017). Sistemų sąveikumas kaip mokslo publikacijų talpyklų tobulinimo sąlyga mokslinėje komunikacijoje. *Informacijos mokslai*, 78, 7–35. <https://doi.org/10.15388/Im.2017.78.10832>.
- LIBER. (2015). *Libraries & research data: towards a new leadership role*. Retrieved August 30, 2018, from <https://libereurope.eu/wp-content/uploads/2015/11/LIBER-Libraries-and-Research-Data-factsheet1.pdf>.
- Lietuvos Respublikos mokslo ir studijų įstatymas. (2017). *Valid summary Jul 1, 2017 – Jul 31, 2017*. Retrieved July 25, 2017, from <https://www.e-tar.lt/portal/en/legalAct/TAR.C595FF45F869/okFtGBBYQk>.
- Lithuanian Academic Library Network. (2017). *LABT ETD Objects*. Retrieved July 29, 2017, from <http://www.labt.lt/About-LABT/Statistics/LABT-ETD-Objects/>.
- Mercer, H. (2011). Almost halfway there: an analysis of the open access behaviors of academic librarians. *College & Research Libraries*, 72(5), 443–453. <https://doi.org/10.5860/crl-167>.
- MIDAS. (2015). *About MIDAS. Information about MIDAS project*. Retrieved May 21, 2017, from <https://midas.lt/public-app.html#/apie-midas?lang=en>.
- Ministry of Education and Science. (2014). Įsakymas dėl Švietimo ir mokslo ministro 2006 m. liepos 14 d. įsakymo Nr. ISAK-1506 „Dėl Lietuvos mokslo ir studijų elektroninių dokumentų informacinės sistemos (eLABa) įsteigimo“ pakeitimo. No.V-838. Retrieved May 18, 2017, from <https://www.e-tar.lt/portal/lt/legalAct/e2ede95042f911e4b328ee8724e3e13c>.
- Ministry of Education and Science. (2015). Įsakymas dėl Švietimo ir mokslo ministro 2010 m. liepos 10 d. įsakymo Nr. V-1128 „Dėl Mokslo ir studijų institucijų mokslo (meno) darbų vertinimo metodikos“ pakeitimo. No.V-79. Retrieved June 16, 2017, from <https://www.e-tar.lt/portal/lt/legalAct/d2944660ad2711e4b1d79f4bef60993c>.
- Ministry of Education and Science. (2017a). Įsakymas dėl 2014–2020 metų Europos Sąjungos fondų investicijų veiksmų programos 9 prioriteto „Visuomenės švietimas ir žmogiškųjų išteklių potencialo didinimas“ 09.3.3-LMT-K-712 priemonės „Mokslininkų, kitų tyrėjų, studentų mokslinės kompetencijos ugdymas per praktinę mokslinę veiklą“ projektų finansavimo sąlygų aprašo Nr.1 patvirtinimo. Nr. V-197. 4 priedas. Retrieved May 20, 2017, from <https://www.e-tar.lt/portal/lt/legalAct/a7ae81f013811e79800e8266c1e5d1b>.
- Ministry of Education and Science. (2017b). Įsakymas dėl 2014–2020 metų Europos Sąjungos fondų investicijų veiksmų programos 1 prioriteto „Mokslinių tyrimų, eksperimentinės plėtros ir inovacijų skatinimas“ 01.2.2-LMT-K-718 priemonės „Tiksliniai moksliniai tyrimai sumanios specializacijos srityje“ projektų finansavimo sąlygų aprašo Nr. 1 patvirtinimo. Nr. V-237. 5 priedas. Retrieved May 20, 2017, from <https://www.e-tar.lt/portal/lt/legalAct/78cadfb01f4711e78397ae072f58c508>.

Ministry of Education and Science. (2017c). *Aukštojo mokslo pertvarka*. Retrieved July 30, 2017, from <https://www.smm.lt/web/lt/aukstojo-mokslo-pertvarka>.

Moedas, C. (2016). *Speech by commissioner Carlos Moedas in Amsterdam, NL: "Open science: share and succeed."* Retrieved August 27, 2018, from http://europa.eu/rapid/press-release_SPEECH-16-1225_en.htm.

Morais, R., & Borrell-Damian, L. (2018). *Open access: 2016-2017 EUA survey results*. Retrieved August 30, 2018, from <https://eua.eu/Libraries/publications-homepage-list/open-access-2016-2017-eua-survey-results.pdf?sfvrsn=2>.

Okamoto, K. (2013). Making higher education more affordable, one course reading at a time: academic libraries as key advocates for open access textbooks and educational resources. In *Public Services Quarterly*, 9(4), 267–283. <https://doi.org/10.1080/15228959.2013.842397>.

OpenAIRE. (2017). *OpenAIRE Compatible Data Providers*. Retrieved 29 July, 2017, from <https://www.openaire.eu/search/data-providers>.

OpenDOAR. (2018). *OpenDOAR statistics*. Retrieved August 27, from http://v2.sherpa.ac.uk/view/repository_visualisations/1.html.

Petrauskienė, Z., & Kuprienė, J. (2017). VU eLABa interview with researchers data file. In *Registration of publications into eLABa: interviews with VU researchers 2017*. Retrieved July 30, 2017, from https://doi.org/10.18279/MIDAS.20170508_VU_eLABa_mokslininku_interviu_duomenys_publicavimui.xlsx.29832.

Priti, J. (2012). Promoting open access to research in academic libraries. *Library Philosophy and Practice*, 2012(737), n.p. Retrieved August 30, 2018, from <http://digitalcommons.unl.edu/libphilprac/737>.

Research Council of Lithuania. (2016). *Resolution regarding the approval of the Guidelines on Open Access to scientific publications and data*, 29 February 2016, No. VIII-2, Vilnius. Retrieved August 20, 2018, from https://www.lmt.lt/data/public/uploads/2016/09/eng_atvira-prieiga-galutinis.pdf.

Rieh S. Y., & Smith, K. (2009). *Topic 1: all universities should have an institutional repository*. Retrieved August 30, 2018, from <https://onlinelibrary.wiley.com/doi/epdf/10.1002/bult.2009.1720350407>.

ROARMAP. (2018). *How many open access policies are there worldwide?* Retrieved August 27, 2018, from <http://roarmap.eprints.org/dataviz2.html>.

Salem J. A., Jr. (2017). Open pathways to student success: academic library partnerships for open educational resource and affordable course content creation and adoption. *The Journal of Academic Librarianship*, 43(1), 34–38. <https://doi.org/10.1016/j.acalib.2016.10.003>.

Schmidt, B., & Kuchma, I. (2012). *Implementing open access mandates in Europe*. OpenAIRE. Göttingen: Universitätsverlag. Retrieved May 20, 2017, from <http://www.oopen.org/download?type=document&docid=610312>.

- Suber, P. (2009). *Timeline of the open access movement*. Retrieved August 27, 2018, from <http://legacy.earlham.edu/~peters/fos/timeline.htm>.
- Targamadze, A. (2005). *ITMIS programos inicijuoti ESF valstybinės svarbos projektai* [Slideshow]. Retrieved August 27, 2018, from http://lvb.sf.library.lt/files/2005-04-27/20050427_Targamadze.pps.
- Tenopir, C., Birch, B., & Allard, S. (2012). *Academic libraries and research data services: current practices and plans for the future*. Retrieved August 30, 2018, from http://www.ala.org/acrl/sites/ala.org.acrl/files/content/publications/whitepapers/Tenopir_Birch_Allard.pdf.
- Tenopir, C., Hughes, D., Allard, S., Frame, M., Birch, B., & Lundeen, A. (2015). Research data services in academic libraries: data intensive roles for the future? *Journal of eScience Librarianship* 4(2), 1–21. <https://doi.org/10.7191/jeslib.2015.1085>.
- Tenopir, C., Talja, S., Horstmann, W., Late, E., Hughes, D., Pollock D., ... Allard, S. (2017). Research data services in European academic research libraries. *Liber Quarterly*, 27(1), 23–44. <https://doi.org/10.18352/lq.10180>.
- The Royal Society. (2018). *Philosophical Transactions – the world’s first science journal*. Retrieved August 27, 2018, from <http://rstl.royalsocietypublishing.org/>.
- Vilniaus Universitetas. (2013). *Isakymas dėl Nacionalinio atviros prieigos mokslinių tyrimų duomenų archyvo informacinės sistemos nuostatų patvirtinimo*, 2013 m. rugsėjo 9 d., Nr. R-423. Retrieved May 21, 2017, from http://registrai.lt/management/object_files/get_object_file/10838/1/418.
- Vilnius University Library. (2014). *VU Publikacijų duomenų bazėje jau 50,000 irrašų*. Retrieved May 21, 2017, from <https://biblioteka.vu.lt/naujienos/mokslinė-komunikacija/vu-publikacijų-duomenų-bazėje-jau-50-000-irasu>.
- Vilnius University Library. (2015a). *2014 Annual Report*. Retrieved July 29, 2017, from https://biblioteka.vu.lt/files/Dokumentai/naujienu/ataskaita_final_digital.pdf.
- Vilnius University Library. (2015b). *Dėl VU mokslinių publikacijų ir studijų baigiamųjų darbų įkėlimo į eLABa*. Retrieved May 21, 2017, from <https://biblioteka.vu.lt/naujienos/mokslinė-komunikacija/del-vu-moksliniu-publikaciju-ir-studiju-baigiamuju-darbu-ikelimo-i>.
- Vilnius University Library. (2017). *Handling of research data at Vilnius university: innovations, convenience and security*. Retrieved May 21, 2017, from <https://biblioteka.vu.lt/en/news/scholarly-communication/handling-research-data-vilnius-university-innovations-convenience-and>.
- Vilnius University Senate. (2017). *Vilniaus universiteto bibliotekos nuostatai*. Approved June 13, 2017, No.S-2017-7-7 [unpublished].

Notes

¹ According to the data provided by the Research and Higher Education Monitoring and Analysis Centre in Lithuania: *Lietuvos mokslo ir studijų būklės apžvalga* (2016). Retrieved May 18, 2017, from [http://mosta.lt/images/leidiniai/Lietuvos mokslo ir studiju bukle 2016.pdf](http://mosta.lt/images/leidiniai/Lietuvos_mokslo_ir_studiju_bukle_2016.pdf).

² Vilniaus Universitetas (2017). *Faktai ir skaičiai*. Retrieved June 16, 2017, from <http://www.vu.lt/apiemus/faktai>.

³ Lietuvos Respublikos mokslo ir studijų įstatymas, 2009 m. balandžio 30 d. Nr. XI-242. Retrieved May 18, 2017, from <https://www.e-tar.lt/portal/lt/legalAct/TAR.C595FF45F869>.

⁴ Data provided by Vilnius University Library, July 31, 2017.

⁵ Data provided by Vilnius University Centre of Information Technology Development, July 31, 2017.

⁶ The research was described and the results were presented by Kupriene, Prokopcik and Petrauskiene (2017). As this research is in Lithuanian language, some key findings of the research are presented in this article to the international community in English.

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