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POLISH DIGITAL LIBRARIES AND REPOSITORIES. ORIGINS, OPERATION AND USAGE

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KEYWORDS: Digital libraries. Research repositories. Digitisation. Copyright protection in libraries. Library technologies.

ABSTRACT: **Thesis/purpose of the article** – The author, an active participant of many projects aimed at building a network of digital libraries and research repositories in Poland, recalls certain facts and opinions not only from a historical perspective, but also as an attempt to provide a picture of what has been achieved in this area to date. **Methodology** – The article discusses numerous problems and dilemmas faced not only by librarians, but also by IT specialists, researchers, museum workers and documentalists. **Results/conclusions** – Not all relevant developmental stages or statistics have been mentioned, but we have tried to outline those considered important, while others are quoted as references to the literature for further information.

INTRODUCTION

Although Poland might not be the most advanced country as far as digitisation is concerned, it has an immense potential and has been catching up at a fast pace. Significant gaps exist, especially in the dissemination and publication of digital data by public agencies. According to available reports, Poland lags behind most other European countries in this respect (being low on the list at 24th), since public information is not as openly accessible as it should be following applicable laws adopted for this purpose years ago. Entrepre-

neurs, researchers and NGOs campaign for public information to be freely available in open formats, since they need it to develop their social activities, businesses or scientific research. This situation has been analysed in a report issued by the Polityka Insight Centre for Policy Analysis entitled *"Czas na przyspieszenie — cyfryzacja gospodarki Polski"* [Time to Accelerate – The Digitisation of the Polish Economy][1].

Among general reports or analyses concerning the entire country, the development of digital libraries (DL) and research repositories (RR) deserves a special mention, since despite certain problems and gaps in this area the overall picture is widely positive.

This article discusses separately the processes of building cultural and scientific digital resources due to both their distinctive character and the purposes for which they were created. The resources of digital libraries, which appeared in Poland much earlier (2002) than research repositories (2008), are predominately intended to digitise cultural artefacts and to disseminate their images online. This is done not only to preserve them for the future, but also to promote them within the society, fostering knowledge and education. Research repositories came into existence to spread contemporary research and educational literature, raw research data, conference proceedings, research reports, and other materials, in order to promote research, accelerate innovation, exchange scientific information internationally, and better educate students.

THE ORIGINS OF POLISH DIGITAL LIBRARY (DL) RESOURCES

In the early days, many ideas emerged on how to develop digital resources in Poland, some of them dating back to the beginning of the new millennium (2000). They came from various institutions, both governmental and civil society; however, most of them failed to survive in their original form. Let us recall some of the planned initiatives:

 – The Ministry of National Education and Sport planned to launch a National Online Library.

 – The Scientific Research Committee (KBN) announced they would build a Polish Virtual Library within the ePolska programme.

 – The Polish Librarians' Association planned to launch the Polish Information Resources.

Only the Ministry managed to accomplish their plan in 2002, creating the Polish Online Library,[2] a government-led project initiated by the Scientific Re-

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[1] Raport *„Czas na przyspieszenie – cyfryzacja gospodarki Polski"* [Report: Time to Accelerate – The Digitisation of the Polish Economy]. Polityka Insight Centre for Policy Analysis, Warsaw 2016. [online]. [accessed: 20.10.2016]. Available in WWW: <https://mc.gov.pl/files/innowacyjna_cyfryzacja_0.pdf>.

[2] E. Dobrzyńska-Lankosz (2003). *Polska Biblioteka Internetowa* [The Polish Online Library], *Biuletyn EBIB* [Electronic Library Newsletter] [online], issue 7(47); [accessed: 22.10.2016]. Available in WWW: <http://www.ebib.pl/2003/47/lankosz.php>.

search Committee (KBN), which unfortunately failed to survive. However, bottom-up initiatives began to emerge, such as:

 – *Interklasa Zasoby Edukacyjne Polski* [*Interklasa*. Polish Educational Resources] (http://www.interklasa.pl/portal/index/strony).

 – *AGH – Skrypty* [Textbooks of the AGH University of Science and Technology in Krakow] (http://vtls.cyf-kr.edu.pl/).

 – *Wolontariusze – Biblioteka Sieciowa* [Volunteers – a Web Library] (http://literat.ug.edu.pl/books.htm).

 – *Wydawcy – Wirtualny Wszechświat* [Editors. A Virtual Universe] (http://www.wiw.pl/).

Nevertheless, these projects failed to meet the requirements already established in Europe by that time.

Although Polish politicians declared that digitisation projects were of key importance for the country, this idea was not followed by coherent, professional action leading to a durable project that would comply with international standards. The attempt to build the Polish Online Library (PBI) in 2002 was probably the most notorious example[3] (www.pbi.edu.pl)[4]. The way this project was implemented failed to meet the required standards, resulting in a database which not only lacked accurate bibliographic descriptions, but even viable files. The library cost about 2m PLN, a significant budgetary expense at that time, but the results of this investment turned out to be unstable and generated further costs, as they required the adjustment and transfer of certain files to new software. According to the latest information made available at the National Library website (http://www.bn.org.pl/zasoby-cyfrowe-i-linki/polska-biblioteka-internetowa): "In 2012, an IT tool was developed to support resource transfer from the Polish Online Library to the information system of the National Digital Library POLONA, and a resource assessment was performed to facilitate the migration of digital files. The process of file migration from the PBI to the National Digital Library POLONA was completed in 2016. The useful part of its resources, after in-depth copyright inquiries and metadata correction, was transferred to the National Digital Library POLONA, [...] available online at polona.pl"[5].

An achievement of foremost importance which hugely contributed to the foundation of professional digital libraries in Poland was the Polish dLibra soft-

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[3] B. Bednarek-Michalska (2003). *Polska Biblioteka Internetowa: losy projektu rządowego z punktu widzenia bibliotekarza.* [The Polish Online Library. History of the Government Project from a Librarian's Perspective]. *Notes Wydawniczy* [Editorial Notebook] 4, issue 12, pp. 28-31.

[4] The website no longer exists, and its digital objects were taken over by the National Library of Poland in 2008 following an order from the Ministry, which was meant to act as the curator of the collection.

[5] National Library of Poland, *Polska Biblioteka Internetowa* [The Polish Online Library] [online]. [accessed: 02.12.2016]. Available in WWW: <http://www.bn.org.pl/zasoby-cyfrowe-i-linki/polska-biblioteka-internetowa>.

ware, which – together with the support provided by IT experts from Poznań – encouraged more academic institutions to launch their own initiatives. In 2003, the Poznań Supercomputing and Networking Centre (PCSS) presented its project to the librarian community in response to the new digital means of collecting research materials and making them available. The first model resource to use this software was the Digital Library of Wielkopolska (WBC) (http://www.wbc.poznan.pl/dlibra). It was built slowly but professionally, in compliance with up-to-date international standards and practices. The library was a joint initiative of the Poznań academic community, with contributions from both scientific and public libraries of this city.

The rules regarding its creation and operation were clearly set out and made publicly available: "WBC is an organisational and technological platform for sharing digital didactic and scientific sources of information. Its hardware and software resources functionally form an integral part of specific scientific and public libraries of Poznań. The software and hardware used by the WBC are jointly overseen by the Poznań Scientific Library Foundation (PFBN) and the Poznań Supercomputing and Networking Centre (PCSS). The Foundation manages the way resources are collected and prepared for sharing. The WBC Programme Board makes decisions as to the profile of the WBC resources and its development directions. The materials shared by WBC can be published in either printed or digital form. At the request of the publishing rights owner, access to the materials made available by the WBC can be restricted by a password or IP number. Any royalties and licence fees payable to authors or publishers are subject to separate agreements. The storage period, form of presentation and arrangements for modifying the contents shared by the WBC are also subject to separate agreements with the publisher or the author. The bibliographic description of the publications made available by the WBC follows the rules established for the Dublin Core and MARC 21 international formats as well as the Polish cataloguing guidelines. WBC operates in accordance with Polish copyright and publishing law"[6].

The development of this first bug-free model and its introduction to the librarian community at conferences and sessions triggered a flurry of similar projects which has lasted to this day. New digital libraries started to emerge, along with digital archives and collections of museums and NGOs, building up a large network brought together by the Digital Library Federation (http://fbc.pionier.net.pl/), also managed by the PSSC. The first of these to be completed were:

1. Digital Library of Wielkopolska, Poznań Scientific Library Foundation, Poznań, 01.10.2002.

2. Lower Silesian Digital Library, Wrocław University of Technology, Wrocław 01.11.2004.

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[6] This fragment of the WBC regulations was available on its website back in 2003, later to be changed. Compare: WBC, About the Project: http://www.wbc.poznan.pl/.

3. The Kujawy–Pomerania Digital Library, Central Library of the Nicolaus Copernicus University, Toruń, 01.09.2005.

4. Digital Library of Zielona Góra, Zielona Góra University Library, Zielona Góra, 01.10.2005.

5. Wrocław University Digital Library, Wrocław University Library, Wrocław, 01.12.2005.

6. Lesser Poland Digital Library, Regional Public Library in Cracow, Cracow, 01.01.2006.

7. Digital Library of the Warsaw University of Technology, Central Library of the Warsaw University of Technology, Warsaw, 01.05.2006.

8. Pedagogical Digital Library, Main Library of the Pedagogical University, Cracow, 01.05.2006.

9. Silesian Digital Library, Silesian Library, Katowice, 01.08.2006.

10. FIDES Digital Library, Federation of the Church Libraries "FIDES", Wrocław 11.08.2006.

11. Digital Library of Jelenia Góra, Centre for Information and Education of Jelenia Góra, Jelenia Góra, 01.09.2006.

12. National Digital Library POLONA, National Library of Poland, Warsaw, 01.10.2006.

13. Podlaska Digital Library, University Library in Białystok, Białystok, 01.11.2006.

Today, the holdings of 127 Polish cultural institutions that have been made available by the Federation of Digital Libraries consist of 4.2 m objects (according to data available for December 2016), which illustrates the scale of this network. Most of them, with some exceptions, use the software developed by the PCSS. The Federation is also the largest Polish provider of data sent to Europeana (which holds over 54 m objects from all over Europe).

After Poland joined the European Union in 2004, many initiatives gained momentum. Funds became available, along with recommendations to jointly create common European digital resources. Since 2005, the Ministry of Culture and National Heritage significantly intensified its efforts in order to foster the creation of digital resources for Poland, acting through the National Heritage Department. These operations were moving in the right direction, as they were based on cooperation with experts. On 24 April 2006, the Minister of Culture and National Heritage appointed the Digitisation Team as its auxiliary body. The Team was responsible for:

1. developing a unified digitisation strategy for cultural heritage objects and research papers in Poland, irrespective of their legal status and place of storage;

2. preparation of uniform requirements for libraries, archives, and museums regarding the process of digitisation, sharing, and storage of digital materials;

3. integration of activities undertaken by libraries, museums, and archives in order to digitise national heritage objects.

The team was active for several years and, in consultation with librarians, documentalists, museum officers, and IT specialists, gradually achieved its goals to solve any problems that were arising. It developed the fundamentals of the national digitalisation strategy and provided opinions[7] and expert reports as necessary to ensure coherence with the European policy in this area and to obtain the required funding. In these proposals, digitisation was understood in a broader sense, as building up digital resources, including repositories, and archiving internet materials from the PL domain[8].

PROBLEMS RELATED TO THE BIRTH OF DIGITAL LIBRARY RESOURCES IN POLAND

The main problems encountered while creating the first digital library resources in Poland were:

– lack of government funding in the initial phase;

– gaps in knowledge and in the availability of experts able to professionally explain the rules and standards of building digital libraries; and

– insufficient coordination.

The communities of researchers, IT specialists, and librarians were perfectly aware of these problems and spoke out in order to minimise their impact. The knowledge gap was the easiest problem to solve. The first publications on digital libraries became available in Poland back in the 1990s. An informal team of librarians, supported by the National Ossoliński Institute, was issuing the Electronic Library Newsletter (Biuletym EBIB), and in December 1998 it released the first issue of a journal dedicated to digital libraries, which later systematically published articles on this topic. Other professional journals for librarians also started to discuss this issue. Numerous conferences were held to debate what kinds of digital libraries should be set up in Poland and how. With access to specialised literature, global databases, and international conferences and workshops, a large community of experts developed in our country, able to support others today.

One of the first conferences on creating digital resources was a session entitled "The Internet in Libraries II – Connectivity, Cooperation, Digitisation", organised in Wrocław on 23-26 September 2003 (http://www.ebib.

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[7] B. Bednarek-Michalska, B. Szczepańska (2005). *Biblioteki Cyfrowe. Opinia i komentarz dla MNiI do dokumentu i2010 Digital Libraries COM (2005) 465* [Digital Libraries. Opinion and comments on the i2010 Digital Libraries COM (2005) 465 document issued for the Ministry of Science and Higher Education], Brussels 30.09.2005. *Biuletyn EBIB* [Electronic Library Newsletter] [online], issue 9(70); [accessed: 02.12.2016]. Available in WWW: <http://ebib.pl/2005/70/bednarek-michalska_szczepanska.php>. ISSN 1507-7187.

[8] B. Bednarek-Michalska (2007). *Biblioteki cyfrowe w Polsce. Stan z roku 2006* [Digital Libraries in Poland. State of Play in 2006] [preprint] [online], [accessed: 02.12.2016]. Available in WWW: <http://kpbc. umk.pl/dlibra/docmetadata?id=25657>.

pl/publikacje/matkonf/iwb2/index.php) by the Polish Librarians' Association, the Committee on Electronic Editions, and the Library of the Wrocław University of Technology, co-funded by the Wrocław City Mayor[9]. Subsequent conferences were held at short intervals, even several times a year. Their organisers were: the Polish Librarians' Association, the National Library of Poland, the Poznań Supercomputing and Networking Centre, and other research centres.

Unlike acquiring knowledge, acquiring the necessary funds to build infrastructures – as well as to scan, process, and catalogue the files and documents – proved to be difficult. The first Polish digital libraries financed their digital resources from their own funds. This was done mostly by academic centres which had the required IT infrastructure and a better educated staff. In 2006, several large digital libraries in Poland founded by academic institutions (Adam Mickiewicz University in Poznań (UAM), Nicolaus Copernicus University in Toruń (UMK), Wrocław University of Technology, University of Zielona Góra, and University of Wrocław), which made their statistics and metadata transparently available, had a collection made up of 40,100 objects, accessed 6,717,960 times since June 2004, which is to say slightly over 3m times annually in two years. The institutions emphasised they received little public funding for this purpose[10]. This number indicated the extent of public demand for electronic resources. With more funding and dynamic promotional efforts, these numbers could be increased, which would also reinvigorate and improve the condition of research and education in Poland. However, the only funds available back then were EU funds, which were relatively hard to obtain. One of the first digital libraries that came into existence with support from foreign funds (from the Integrated Operational Programme of Regional Development) was the Kujawy–Pomerania Digital Library. The project was very successful and widely discussed in the literature[11], with information about it openly shared with the public, along with subsidy applications, so that other libraries could follow in its footsteps.

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[9] International conference "Internet in Libraries II. Connectivity, Cooperation, Digitisation", Wrocław, 23-26 September 2003. [online], [accessed: 28.12.2016]. Available in WWW: <http://www.ebib.pl/publikacje/matkonf/iwb2/index.php>. ISBN: 83-915689-5-4>.

[10] B. Bednarek-Michalska, *Biblioteki cyfrowe w Polsce. Stan z roku 2006.* [Digital Libraries in Poland. State of Play in 2006]. [online], [accessed: 20.10.2016]. Available in WWW: <http://kpbc.ukw.edu.pl/dlibra/doccontent?id=25657>.

[11] B. Bednarek-Michalska (2005). *KPBC — projekt 2003-2006.* [Kujawy-Pomerania Digital Library. The 2003-2006 Project]. In: *Materiały konferencji Infobazy 2005, bazy danych dla nauki.* [Infobazy 2005 Conference Proceedings. Databases for Science]. Gdańsk: Gdańsk University of Technology, TASK, pp. 77-84; and B. Bednarek-Michalska (2006). *Kujawsko-Pomorska Biblioteka Cyfrowa — pragmatyka tworzenia biblioteki cyfrowej.* [Kujawy–Pomerania Digital Library. The Pragmatics of Building a Digital Library]. *Biuletyn EBIB* [Electronic Library Newsletter] [online], issue 7 (77); [accessed: 20.10.2016]. Available in WWW: <http://ebib.pl/publikacje/matkonf/iwb3/artykul.php?b>.

It was not until 2010 that the Polish government allocated more significant public funds to digitisation and established specific agencies to manage them: The National Audiovisual Institute (NInA), the National Institute for Museums and Public Collections (NIMOZ) and the National Digital Archive (NAC), which considerably accelerated the development of digital collections. Multi-annual government programmes such as Kultura+ and Biblioteka+ were implemented, so that an increasing number of cultural institutions could equip their digitisation workshops and proceed to scanning their holdings[12]. Librarians, museum professionals, and documentalists were also working on improving their skills, which enabled them to submit successful applications and implement their projects, which was not an easy task, as back then such skills were in short supply. This resulted in a surge of digital libraries, archives, and museum portals. Many of them are very modern and compatible with European projects.

Although in its initial stage the emergence of digital libraries was completely uncoordinated, this gap was relatively quickly noticed, which led to several regional platforms being set up, such as the Lower Silesian Digital Library or the Kujawy–Pomerania Digital Library. It seemed that the idea to coordinate digitisation efforts at the regional level was a positive step towards building a coherent, nationwide system. Unfortunately, soon the particular interests of specific institutions started to prevail, dispersing the digitisation initiatives. This was especially evident in Warsaw, where many digital libraries appeared, each digitising nothing but its own holdings. Coordination became a necessity to avoid duplication and to disseminate objects more effectively. Librarians realised that fragmentation was a highly negative and costly problem. At their request, IT experts from the PCSS developed a tool for the dLibra system to scan it for duplicates and prevent their occurrence. Further discussions among digital library professionals led to establishing the Digital Library Consortium in order to coordinate certain steps and highlight emerging problems, for example with metadata.

At the initiative of the Poznań Scientific Library Foundation, on 28 May 2008 at the Research Centre of the Polish Academy of Sciences in Poznań, a session was held gathering representatives of all regional digital libraries in Poland, who undertook to sign a cooperation agreement. Under this agreement, the Polish Digital Libraries (PBC) consortium was set up, with the main purpose of coordinating the efforts related to developing domestic digital resources[13].

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[12] See: National Audiovisual Institute. *Baza projektów digitalizacyjnych*. [Digitisation Project Database]. [online], [accessed: 02.01.2017]. Available in WWW: <https://baza.nina.gov.pl/>.

[13] Poznań Scientific Library Foundation (2008). *Polskie Biblioteki Cyfrowe* [Polish Digital Libraries][online], [accessed: 20.10.2016]. Available in WWW: <http://www.pfsl.poznan.pl/polskie-biblioteki-cyfrowe>.

While problems with the operation of digital libraries are different today from those faced at earlier stages, some of the latter have not been resolved yet. Coordination is one of them. Not all entities producing digital resources in Poland joined the 2008 consortium, which additionally had no government support and was nothing but a bottom-up initiative from the academic community. At that time, public administration was not ready for such challenges yet, neither was the National Library.

In 2009, the government began to set up Competence Centres to coordinate digitisation efforts in specific sectors. However, some of these failed to accomplish their tasks, which is one of the major problems highlighted by professionals, especially librarians. Competence Centres formed part of the Programme for the digitisation of cultural assets and the collection, conservation and sharing of digital objects in Poland for the years 2009-2020. Their main responsibilities have been defined as follows:

– implementing technological developments in digitisation and storage of digital data;

– coordinating the collection and storage of digital resources;

– educating the personnel of cultural institutions responsible for digitisation;

– sharing digitised materials and the promotion of digital resources.

The programme, launched by the Ministry of Culture and National Heritage, included the establishment of Competence Centres at the following institutions:

– National Digital Archive,

– National Audiovisual Institute,

– National Library of Poland,

– National Heritage Board of Poland,

– National Institute for Museums and Public Collections[14].

The Competence Centre at the National Library of Poland leaves much to be desired[15], as in practical terms it is the PCSS that fulfils its tasks, such as launching the Digital Library Federation (FBC), developing the required technological tools, organising training sessions, and sending data to Europeana.

Long-term storage and the protection of resources is a major challenge for librarians responsible for digital collections. Poland is not properly prepared for such tasks, and the role of the Competence Centres is very limited in this respect.

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[14] National Digital Archive. *Centrum Kompetencji* [Competence Centre] [online], [accessed: 22.10.2016]. Available in WWW: <http://www.nac.gov.pl/archiwum-cyfrowe/digitalizacja/centrum-kompetencji/>.

[15] National Library of Poland. *Centrum Kompetencji* [Competence Centre] [online], [accessed: 20.10.2016]. Available in WWW: <http://www.bn.org.pl/programy-i-uslugi/centrum-kompetencji>.

"The number of digital documents increases every year. These are either products of digitisation or born-digital files. Therefore, the issue of long-term digital data storage is gaining in importance every year, becoming key to the accessibility of digital materials in the future. […] Nation-wide initiatives are implemented in order to preserve and protect data. A case in point is the E-Museums project or the NIMOZ proposal for introducing a system of durable identifiers for cultural heritage objects. The Poznań Supercomputing and Networking Centre [...] also actively campaigns for long-term archiving through the development of the dArceo software and R&D work in this area"[16].

Librarians, archivists and museum professionals urgently need training, so that they can learn about digitisation procedures to start planned actions in this area. Some institutions, such as the Nicolaus Copernicus University in Toruń, use the National Data Storage service provided by the PIONIER research network, but remain unsure whether it will be continued in the future. National Data Storage was designed to respond to the needs of protecting and archiving substantial amounts of data produced by public institutions, to offer backup and archiving services, and to provide a virtual file system. Unfortunately, the project has stalled, which hampers the institutions' work.

The National Library of Poland runs the National Library Electronic Document Repository "to store publications distributed by publishers in Poland solely in electronic format. To comply with the statutory requirement stipulated in the Law on Mandatory Legal Deposits, the publishers provide the Repository with documents in PDF format, such as electronic books and periodicals as well as audio-visual records (mp3). Additionally, publications released in hard copy are transferred to the Repository in order to ensure their safe archiving. As most documents stored in the Repository are copyright protected, they are made available exclusively from terminals located in the National Library building"[17]. The Repository is not, however, responsible for collecting and protecting all the resources of digital libraries operating in Poland. This causes a major problem which can lead to dire consequences.

Copyright regulations in their current form represent a clear obstacle for the National Library, hampering many digitisation projects. It was relatively late that copyright protection problems similar to those encountered worldwide arose in Poland. These resulted from gaps in the understanding of existing serious limitations relating to the dissemination of creative work. Everyone knew it was safer to digitise and share older materials, but ignored legal de-

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[16] T. Parkoła (2014). *Długoterminowe przechowywanie cyfrowego dziedzictwa kulturowego.* [Long-term Storage of Digital Cultural Heritage]. *Biuletyn EBIB* [Electronic Library Newsletter] [online], issue 9 (154), *Gromadzenie i zabezpieczanie danych cyfrowych* [Collection and Protection of Digital Data]; [accessed: 20.12.2016]. Available in WWW: <http://open.ebib.pl/ojs/index.php/ebib/article/view/303>.

[17] National Library of Poland, Electronic Document Repository [online], [accessed: 28.12.2016]. Available in WWW: <http://www.bn.org.pl/programy-i-uslugi/centrum-kompetencji/udostepnianie-zbiorow-cyfrowych/repozytorium-dokumentow-elektronicznych>.

tails related to the types of digitised objects or to copyright time limits. No one was familiar with the concepts of public domain or piracy. No one was aware of the legal issues arising out of the mere digitisation process itself, without even necessarily being followed by dissemination.

It was not until 2008 that librarians, museum professionals, and documentalists began to seriously debate these issues, as the Open Education Coalition[18] began to hold copyright conferences. This discussion also reached nationwide media, whose numbers had increased at the beginning of the new century. As electronic media emerged, the respective legal issues became more and more evident. Debates and protests escalated in the wake of the Google Books controversy. Publishers and authors demanded copyright to be respected and forbade scanning their works.

Debates at the European level, often organised by the European Commission as well as by the Commission's subsidy programs, shaped the new legal regulations to a significant extent. It took many years to develop copyright rules that today help to disseminate works, including orphan works. The Poles actively contributed to this discussion; however, some problems remain unsolved. All in all, each digital object is different and has a unique legal history which the librarian or documentalist should assess. Some objects are easy to check while for others no viable decision can be made. The only universally adopted solution is to elaborate handbooks and guidelines and to provide specific examples so that analogies can be found and selected models of dissemination applied.

In this respect, Centrum Cyfrowe Projekt: Polska (a member of KOED) stands out, as on its website it provides extensive and useful guidelines, opinions, and expert reports on disseminating digitised works[19]. The Prawokultury.pl educational service also offers interesting information: "The website provides information in an intelligible and reliable way about any matters related to the subject of copyright. It has been created as part of the Future of Copyright project financed by the Trust for Civil Society in Central and Eastern Europe. The Modern Poland Foundation does its best to make this website a source of information on vital developments related to copyright reform. It provides the latest news, opinions and reports as well as the positions of the Foundation resulting from public consultations on copyright issues"[20].

Some Competence Centres also compile similar literature. For instance, the National Institute for Museums and Public Collections is very active in this

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[18] Publications of the Open Education Coalition (KOED) on open access. KOED Warsaw [online], [accessed: 24.10.2016]. Available in WWW: <http://koed.org.pl/pl/materialy/publikacje-koed-o-otwartosci/>.

[19] Centrum Cyfrowe. Czytelnia [Reading Room] [online], [accessed: 24.10.2016]. Available in WWW: <https://centrumcyfrowe.pl/czytelnia/>.

[20] Modern Poland Foundation. Prawokultury.pl. About us [online], [accessed: 14.11.2016]. Available in WWW: <http://prawokultury.pl/>.

area. On its website, (http://digitalizacja.nimoz.pl/) it provides handbooks, guidelines, legal regulations, dates for training courses, recommendations etc. In a nutshell, all a digitisation professional needs to know.

PROBLEMS RELATED TO THE USE OF DIGITAL LIBRARY RESOURCES

Polish digital resources are relatively widely used, with millions of views of particular web pages annually. Users report their problems directly to the service providers. Problems with the DjVu file format, selected years ago due to its compression capacity, are among the most frequent. To view such files, users often have to install special plug-ins on their computers; however, certain browsers do not accept them. Consequently, many institutions have opted for creating PDF files, even though these can sometimes get very large, which represents another challenge. On the websites, librarians and IT specialists provide instructions on how to view DjVu files. An example of this is the PCSS handbook[21], or the one available from the Maria Curie-Skłodowska University in Lublin (UMCS) website: "The UMCS Digital Library has introduced a test mechanism to view objects in DjVu format without installing any additional plug-ins. To check whether it works correctly, select any object in DjVu format and choose 'DJVU — HTML5' from the list of viewing options"[22].

The dLibra software also causes numerous technical issues, as indicated by constant consultations regarding this topic on the Federation's discussion websites (http://fbc.pionier.net.pl/qa/index.php/questions). IT specialists from the PCSS try to respond to queries on an on-going basis, without, however, always achieving a 100% success rate.

Some of the most frequently reported problems concern resource browsing, as the current features do not always provide optimum support to users, search bots, or librarians. Since the Polish library network does not develop any common model records or thesauruses, each institution uses its own key words, which creates incoherence at the Federation level. This problem was spotted at a relatively early stage[23] and discussed on multiple occasions; however, no funds have yet been obtained to solve it.

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[21] Poznań Supercomputing and Networking Centre. Digital Library Federation. Instructions on how to view DjVu files. [online], [accessed: 24.10.2016]. Available in WWW: <https://confluence.man.poznan.pl/community/pages/viewpage.action?pageId=47024412>.

[22] UMCS Digital Library. News. View DjVu files without installing any plug-ins! [online], [accessed: 24.10.2016]. Available in WWW: <http://dlibra.umcs.lublin.pl/dlibra/news?news=full#5d8a42f8-cbbf-4b8b-8fbb-d1fbd4268686>.

[23] A. Seidel-Grzesińska; K. Stanicka-Brzezicka (2009). *Tezaurus dziedzictwa kulturowego. Prezentacja narzędzia wspomagającego tworzenie i wykorzystanie baz danych* [National Heritage Thesaurus. Demonstration of a tool to support the creation and use of databases][online]. Presentation from the "Polskie Biblioteki Cyfrowe" [Polish Digital Libraries] Conference. [accessed: 24.10.2016]. Available in WWW: <http://lib.psnc.pl/dlibra/docmetadata?id=219>.

Another issue is the standardisation of bibliographic descriptions for electronic documents. Despite using the common Dublin Core Schema to describe electronic documents in nearly all centres, in practice the description methodology in particular metadata fields is far from uniform. The contents of description fields vary greatly. One example of this is the variety of entries found in the RIGHTS fields. Each institution fills these fields with different contents. These are sample descriptions of contemporary copyright protected objects from KPBC, POLONA and WBC:

KPBC:
    Rights: *All rights reserved.*
    Copyright owner: *Górski, Wacław.*
    Licence: *UMK licence.*
    Access rights: Everyone, within the limits of permitted use.

Polona:
    Rights: Publication made available with publisher's consent. None of its parts can be processed or used for commercial purposes.

WBC
    Rights to the publication: *Library of the Poznań University of Technology*
    Copyright owner: Library of the Poznań University of Technology

Not only do such discrepancies make browsing harder, but they also hinder scientific research. Based on FBC metadata, the Nicolaus Copernicus University in Toruń carried out a study within the project of the National Science Centre (NCN) entitled "Information Visualization methods in digital knowledge structure and dynamics study". The project was managed by Veslawa Osińska, PhD, and analysed the development of the humanities and social science in Poland using the visualization methodology (http://www.wizualizacjanauki.umk.pl/pl/#o_projekcie). Unfortunately, the authors were obliged to discuss issues resulting from such arbitrariness and lack of coherence in bibliographic descriptions, which they subsequently analysed[24].

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[24] V. Osińska; P. Malak; B. Bednarek-Michalska: *Badanie struktury i dynamiki zasobów cyfrowej wiedzy przy pomocy metod wizualizacji — projekt realizowany na UMK* [Information Visualization methods in digital knowledge structure and dynamics study. A Project of the Nicolaus Copernicus University in Toruń]. In: *Humanistyka Cyfrowa. Badanie tekstów, obrazów i dźwięku. Lublin e-naukowiec.eu 2016.* [Digital Humanities. Studies on Text, Image and Sound. Lublin e-naukowiec. eu 2016.] Radosław Bomba, Andrzej Radomski, Ewa Solska (eds.) [online], pp. 8-18 [accessed: 24.10.2016]. Available in WWW: <http://e-naukowiec.eu/wp-content/uploads/2016/05/Humanistyka_cyfrowa.pdf>.

POLISH RESEARCH REPOSITORIES (RR) AND EVOLUTION
DYNAMICS

The process of creating Polish research repositories evolved in a slightly different manner than that of digital libraries. It was closely connected with the Open Access Movement in research, first discussed in the Polish specialised press in 2005[25], right after the Budapest Open Access Initiative was signed[26]. However, the history of this movement in Poland dates back to as early as the 1990s (http://uwolnijnauke.pl/kalendarium-oa-w-polsce/), when researchers launched the first Polish journals available online. These were bottom-up initiatives stemming strictly from the needs of the researchers' community, uncoordinated and lacking government funding. As a result of such initiatives, in 2004, 13 Polish open access journals were listed in the Directory of Open Access Journals (DOAJ), and the Central Library of the Nicolaus Copernicus University in Toruń began to cooperate with DOAJ. Librarians from Toruń verified Polish open access journals and promoted the OA movement in our country. That very year, Poland became one of the 34 countries to sign the *OECD Declaration on Access to Research Data from Public Funding* (http://www.oecd.org/science/sci-tech/sciencetechnologyandinnovationforthe21stcenturymeetingoftheoecdcommitteeforscientificandtechnologicalpolicyatministeriallevel29-30january2004-finalcommunique.htm). However, this did not mean that the government took any legal, organisational or political action. This did not happen until years later.

At the beginning of the present century, there was virtually no information available about open science in Poland. It took years for this idea to reach the scientific community. This was largely due to the efforts of prof. Marek Niezgódka from the Interdisciplinary Centre for Mathematical and Computational Modelling at the University of Warsaw (ICM UW), who has been successfully promoting open access both within the scientific community and in public administration circles[27]. In 2003, ICM UW formally signed the Berlin Declaration (https://openaccess.mpg.de/Berlin-Declaration).

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[25] *Biuletyn EBIB* [Electronic Library Newsletter] [online], issue 2 (63); [accessed: 24.10.2016]. Available online: <http://www.ebib.pl/2005/63/index.php. ISSN 1507-7187>.

[26] *The Budapest Open Access Initiative* [online], [accessed: 10.01.2005]. Available online: <http://www.soros.org/openaccess/>.

[27] M. Niezgódka (2007). *Projekt DIR jako przykład praktycznej realizacji idei Open Access.* [The DIR Project: An Example of Practical Implementation of the Open Access Idea]. In: *IV Ogólnopolska Konferencja EBIB Internet w bibliotekach Open Access.* [The 6th Polish EBIB Conference on the Internet in Open Access Libraries]. *Toruń, 7-8.12.2007. EBIB Materiały konferencyjne* [EBIB Conference Proceedings] [online], issue 18, [accessed: 02.01.2017]. Available in WWW: <http://ebib.pl/publikacje/matkonf/mat18/niezgodka.php>.

Academic librarians were the first to find out about the Open Access Movement and started to regularly discuss the idea[28]: "The Open Access tradition takes its origin from the experience of building the first ever open archives of electronic documents (e-prints) called Open Archives. They were to accelerate the flow of information between scientists, especially in the fields of mathematics, physics, IT, medicine and chemistry. Their main objective was to provide open, free of charge and, most importantly, quick access to knowledge. Such archives started to dynamically develop in the U.S. and in Western Europe. Today, the Open Archives idea is pursued by an initiative officially known as Open Access (OA). Its main purpose is to create electronic archives, to publish research outcomes more economically and to make them freely available online. Finally, it also aims to develop and promote public awareness in this field"[29].

In the years 2006 and 2007, librarians organised the first open access seminar (in Poznań)[30] and conference (in Toruń) in Poland; one year later, as a result of these sessions, the Open Education Coalition was formed (http://koed.org.pl/pl/) (2008). This influential organisation brings together communities interested in the open access idea, not only in the sciences, but also in culture and education. This greatly expedited the promotion of the open science idea. Its sessions brought together people who were ready to take the time to promote open access models, among other things by studying foreign literature and working with institutions from other countries.

Up to approximately 2015, the main goal of the movement was to create open repositories of scientific papers; then, its priorities shifted towards open research data. Research repositories started to emerge in Poland in 2006. The first one was the PCSS Institutional Repository, followed by the first international ECNIS repository, established in 2007 within the 6th EU Framework Programme by the Scientific Library of the Occupational Medicine Institute in Łódź, and by the Adam Mickiewicz University Repository (AMUR), set up by librarians of this university. This is the list of the earliest Polish repositories collecting the research papers of university academics and openly disseminating them:

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[28] See: *Biuletyn EBIB* [Electronic Library Newsletter] (2005) issue 73 on open access [online], [accessed: 02.01.2017]. Available in WWW: <http://www.ebib.pl/2005/63/>.

[29] B. Bednarek-Michalska, *Wolny dostęp do informacji i wiedzy czy wykluczenie edukacyjne?* [Free access to information and knowledge or educational exclusion?] *Biuletyn EBIB* [Electronic Library Newsletter] [online], issue 2 (63); [accessed: 02.01.2017]. Available in WWW: <http://www.ebib.pl/2005/63/michalska.php>.

[30] The first open access workshop in Poland: *eIFL Open Access Workshop 21 September 2006,* Poznań. Organised by: Poznań Scientific Library Foundation, Poznań University of Technology, EIFL. (Jan Nikisch). [online], [accessed: 02.01.2017]. Available in WWW: <http://www.pfsl.poznan.pl/oa/>.

1. PCSS — Poznań Supercomputing and Networking Centre 2006
2. ECNIS — Occupational Medicine Institute in Łódź 2007
3. ENY — Wrocław University of Technology 2008
4. AMUR — Adam Mickiewicz University, Poznań 2010
5. CEON — ICM Repository of the Centre for Open Science 2011
6. RUMAK — Nicolaus Copernicus University in Toruń 2012
7. RUW — University of Warsaw 2012

ICM UW became the coordinator of research repositories for the entire country. Up to this day, they have been running the CEON aggregator (http://agregator.ceon.pl/), a tool for browsing 19 Polish repositories (data as of December 2016). However, not all Polish institutions have joined this network.

The Open Education Coalition reported in its open science portal "Uwolnij Naukę" [Free the Science] that in 2016, 31 repositories were active in Poland (http://uwolnijnauke.pl/baza-wiedzy/). The repositories are visible in FBC and can be browsed along with digital libraries from a sole location (http://fbc.pionier.net.pl/pro/zrodla/#listsheader).

2010 was the most dynamic year in terms of the number of open access initiatives, not only in Poland, but also globally. This was due not only to the impressive efforts of hundreds of Open Access Movement activists who established respectable and influential organisations, but also to leading decisions by the U.S. government which encouraged others to step up their efforts. In 2010, the number of events and debates held in Poland testified to the maturity and informed development of this scientific communication system. The Open Education Coalition coordinated a host of events, inspired further initiatives, and influenced the decisions of ministries for whom they prepared expert opinions. This successfully translated into tangible results such as new guidelines, centres, seminars, workshops, journals, repositories, debates, opinions etc.

The last five years (2011-2016) have seen the further involvement of hundreds of people in Poland, with regular serial events, as well as the engagement of research institutions which officially work in this area through initiatives such as the Open Education Coalition[31] (37 organisations), or through working groups cooperating with the Ministry of Science and Higher Education. The OA Calendar in Poland, made available by the Coalition[32], provides information on all relevant events in this area. Hence, Poland is well positioned to make progress, but works in this area have not been completed yet, and the process of publishing the latest research outcomes is by no means easy.

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[31] Open Education Coalition. Members [online]. [accessed: 29.11.2016]. Available in WWW: <http://koed.org.pl/pl/o-koalicji/czlonkowie/>.

[32] *Uwolnij Naukę.* [Free The Science]. *Kalendarium OA w Polsce* [OA Calendar in Poland] [online]. [accessed: 29.11.2016]. Available in WWW: <http://uwolnijnauke.pl/kalendarium-oa-w-polsce>.

PROBLEMS WITH THE CREATION OF RESEARCH REPOSITORIES (RR) IN POLAND

The problems related to building open research repositories have differed from the ones faced by digital libraries. The main obstacles for their creation were not standards or technologies, since these existed and were well established in many foreign institutions, but mostly the awareness among the Polish scientific community of how important it was to openly spread research outcomes. Academics were not convinced of the benefits of such dissemination, often creating barriers. On top of that, back in 2006 there were no systemic incentives from the public administration, nor were there any respective national strategies. All the actual initiatives came either from IT specialists from institutions such as PCSS or ICM, or from academic librarians, who having utilised the resources of global research archives such as arXiv in Los Alamos, U.S.A., were aware of their value and knew they represented the future of research communication. They also studied the methodology of creating such resources.

At an early stage of designing research repositories, the relevant copyright issues were defined too. However, these differed from the ones faced by digital libraries, since they concerned contemporary work diffused by the authors themselves; therefore, new publication models, acceptable for the authors, needed to be defined, along with technologies to support such processes. The Open Access Movement soon commonly adopted the free Creative Commons licences developed by Lawrence Lessing[33], together with the rules for their transposition into national laws. In Poland, the major problems were gaps in knowledge about these licences as well as the inability to influence legislation. It took the librarians many years to learn about copyright regulations and alternative licences, so that they could subsequently share this knowledge with academics, so as to launch the repositories with all legal safeguards in place. Since 2005, the Creative Commons Polska NGO, managed by Alek Tarkowski, PhD, and Justyna Hofmokl, PhD, has been providing support in this area.

The open repositories had never been receiving suitable funding, as they were set up by the respective universities which covered their operating costs, with some exceptions such as the RCIN repository of the Polish Academy of Sciences (PAN), which was financed from EU funds right from the start. However, the very concept of this repository differed greatly from the ones created elsewhere in the world, since it shared scans of older journals and research papers from various PAN institutes rather than creating fully open resources. Today, the Ministry of Science and Higher Education offers fund-

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[33] L. Lessig (2004). *Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity.* New York: The Penguin Press.

ing from the "Dissemination of Science" funding strand, but applying for it is not always effective. Irrespective of any financial issues, there is no doubt that all this funding comes from the Polish taxpayers, though through diverse channels. However, maintaining a repository is inexpensive, especially if it is based on freely available open source technologies. Therefore, numerous universities have decided to establish their own RRs by their own means.

At its early stage, the worldwide repository network proved highly controversial among scientific publishers. Such concerns were also raised in Poland. The publishers believed open publications would completely ruin their business. Therefore, they offered strong resistance and lobbied against the open access idea, with major publishing houses such as Elsevier, Emerald, Wiley, Springer and others in the lead. However, as unrelenting economic analyses shed light on their monopolistic practices towards universities[34], the academic institutions, unable to freely negotiate their terms, revolted against them. With the unyielding attitude of prominent researchers, including Nobel Prize winners[35], as well as open science advocates such as SPARC or Welcome Trust, publishers relaxed their approach over time and decided to give such new and innovative models a chance. To date, many of them have come up with their own free publishing options. Furthermore, the Open Access Scholarly Publishers Association (OASPA) was launched to bring together major institutions offering alternative models of scientific publishing.

PROBLEMS WITH THE OPERATION OF RRS

Poland has had its official open access policy since 2015[36]. Its implementation depends on autonomous authorities at each university, which seems to slow down the process; however, it is adhered to and supports librarians, who now have the backing of an official government document. Very few academic institutions in Poland have defined their internal open access policies, which is an important practice at some of the American[37] and

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[34] Wellcome Trust (2003). *Economic Analysis of Scientific Research Publishing:* A Report Commissioned by the Wellcome Trust. Histon, Cambridgeshire: SQW Limited [online]. January, [accessed: 02.01.2017]. Available in WWW: <https://wellcome.ac.uk/sites/default/files/wtd003182_0.pdf>.

[35] The U.S. House of Representatives Subcommittee on Investigations and Oversight conducted a hearing on the topic "Examining Public Access and Scholarly Publication Interests." An Open Letter to the U.S. Congress Signed by 52 Nobel Prize Winners [online], p. 138. [accessed: 02.01.2017]. Available in WWW: <https://www.gpo.gov/fdsys/pkg/CHRG-112hhrg73607/pdf/CHRG-112hhrg73607.pdf>.

[36] *Kierunki rozwoju otwartego dostępu do treści naukowych w Polsce* [Development Directions of Open Access Research Contents in Poland] (2015) [online], [accessed: 02.01.2017]. Available in WWW: <http://www.nauka.gov.pl/konsultacje/konsultacje-projektu-kierunkow-rozwoju-otwartego-dostepu-do-tresci-naukowych-w-polsce.html>.

[37] Harvard University. Open Access Policies [online], [accessed: 02.01.2017]. Available in WWW: <https://osc.hul.harvard.edu/policies/>.

Western European universities. The Registry of Open Access Repository Mandates and Policies (ROARMAP) contains 587 drafts of such policies submitted by research institutions (http://roarmap.eprints.org/). An internal policy approved by the university senate would impose certain obligations on members of the staff and clarify the rules on creating such resources. Due to this gap, organisational issues relating to the operation of repositories abound.

At present, the maintenance of a repository should not pose any problems. It is usually performed by librarians and IT specialists in very much the same way as they used to perform the maintenance of bibliographic databases listing publications of university academics in the past. Today, this task also involves adding metadata to digital files, with the consent of authors and sometimes also of publishers. On top of that, an increasing number of CRIS tools (current research information systems) are developed in Poland, mainly by the Universities of Technology in Warsaw (OMEGA PSIR)[38], Wrocław (e-science)[39], and Gdańsk (MOST), which also include storage mechanisms adapted to several types of scientific data, both publications and raw research data. From the technological point of view, these may be solutions that will find applications in the nearest future due to the research management features they offer. Many librarians are already testing such platforms.

Issues with publishers have not been fully resolved yet, especially in Poland[40], even though publishing companies are aware that building digital archives at universities is unavoidable, and that the economic models from the past need to be changed.

PROBLEMS RELATED TO THE USE OF RESEARCH REPOSITORY RESOURCES

A major issue related to the use of all resources stored by the Polish repositories is that there is no single location where such resources could be browsed or where the actual number of Polish repositories could be verified. Even though ICM has developed its aggregator, it does not list all the

[38] O. Giwer; M. Lewandowska-Tranda; M. Miller-Jankowska (2014). *Baza Wiedzy Politechniki Warszawskiej. Współudział Biblioteki Głównej w tworzeniu repozytorium uczelni.* [Knowledge Base of the Warsaw University of Technology. Contribution of the Central Library to the University Repository]. Gdańsk, *Konferencja Infobazy* [Infobazy Conference] [online]. [accessed: 04.01.2017]. Available in WWW: <http://www.infobazy.gda.pl/2014/?ns=program>.

[39] U. Małecka (2016). *Platforma e-science.pl — dedykowana polskim naukowcom.* [The e-science.pl platform dedicated to Polish researchers]. *Biuletyn EBIB* [Electronic Library Newsletter] [online] issue 8 (170); [accessed: 02.01.2017]. Available in WWW: <http://open.ebib.pl/ojs/index.php/ebib/article/view/493. ISSN 1507-7187>.

[40] *Stanowisko PIK ws. OD — Polska Izba Książki* [Position of the Polish Chamber of Books on Open Access][online]. [accessed: 02.01.2017]. Available in WWW: <pik.org.pl/upload/files/MniSW_stanowisko_PIK_ws_OD.pdf>.

repositories; while FBC covers all of them, it fails to show statistics for each and every repository. On top of that, more and more platforms with information on publications emerge, such as the POL-on government system, which includes the Polish Scholarly Bibliography (https://pbn.nauka.gov.pl/), or the Infona portal (https://www.infona.pl/). This negatively affects the integration of research information and undermines the prestige of repositories among the researchers' community.

The Polish research repositories fail to provide a comprehensive spectrum of contemporary scientific publications, sharing only a limited part of these, as authors, who are not obliged to archive and disseminate their papers, often fail to do so. Therefore, the percentage of all Polish publications is small (no statistical information in this respect is available)[41].

The quality of the metadata and files is also an issue, as they are uploaded by the authors themselves. Librarians use their best efforts to ensure proper quality of the objects, but on their servers they often receive objects unprofessionally scanned by their authors, which hinders further processing. Therefore, they often leave the scans with the same quality they were deposited with.

Another problem is that many Polish repositories upload bare metadata without the corresponding digital files, because librarians tend to export them to the repositories from bibliographies and only gradually start adding the files as they obtain the required copyright consents. In such repositories, the files are often available, but only at the premises of the respective institutions. Both cases are manifestly contrary to the principles of building open repositories.

Yet another problem is government policy and the discretionary character of archiving research outcomes in full-text versions. There is nothing beyond some recommendations and regulations that only add complexity to this picture, like the Regulation of the Minister of Science and Higher Education on the availability of PhD dissertations[42] (§ 7.3. In the notifications and in the announcement, the storage place of the PhD dissertation shall also be provided, so that any interested person can consult it, along with a notice on the publication of the dissertation abstract and its reviews on the website of the academic institution or the organisational unit where the PhD title was obtained.) Neither the POL-on system of information on higher education nor institutional repositories are mentioned in the Regulation as places where PhD theses shall be deposited.

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[41] Some data can be found on the FBC list [online], [accessed: 02.01.2017]. Available in WWW: <http://fbc.pionier.net.pl/pro/zrodla/#listsheader>.

[42] Regulation of 26 September 2016 on the specific procedure and conditions for pursuing doctoral dissertations, the habilitation procedure and the conferment of the academic title of professor. [online]. [accessed: 02.01.2017]. Available in WWW: <http://www.bip.nauka.gov.pl/g2/oryginal/2016_10/0753f-fa1b4c82186d82bc85eb6b59661.pdf>.

CONCLUSION

Due to the limited size of this article, we have had to omit many problems which may have provided vital insights into the area of digital libraries and research repositories, and which were dealt with by librarians, IT specialists, and researchers who took on the task of creating digital resources for Poland. The topics mentioned here could not be discussed in full either, as the histories of many projects were often complicated, long, and largely unsuccessful… whether the issue was to pursue lobbying activities at the government level, to promote digital resources within Polish society, or to persuade IT specialists that librarians required complex technologies and not just simple databases. Even though some projects were unsuccessful, the overall result is largely positive. Poland has now attained well-known and abundant digital library and research repository networks. Important digitisation projects have also been pursued outside of these projects (by archives, museums, private collections, and within initiatives such as Fonoteka or Ninateka). The number of digitised objects has reached millions, not thousands, which means Poland is no longer a digitisation "wasteland", even though it is not a leader in this area either.

Poland is reproducing what leading European and American institutions did in the past, implementing organisational models developed elsewhere rather than developing original solutions. This, however, does not have to be a negative thing, as it can be seen as an advantage and a cost optimisation effort. Nevertheless, our country badly needs strong institutions which would provide models to be followed by smaller digitisation centres, contribute to the development of technologies and standards for Europe, participate in major projects, suggest innovations and build top-level professional networks. Since all this is still to come, let us hope the next generation will be bolder and more creative than ours. This is a future which seems to be the only optimum solution for Poland.

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