

# THE BRIDGE TO KNOWLEDGE – OPEN ACCESS TO SCIENTIFIC RESEARCH RESULTS ON MULTIDISCIPLINARY OPEN SYSTEM TRANSFERRING KNOWLEDGE PLATFORM

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(received: 7 August 2017; revised: 8 September 2017;  
accepted: 15 September 2017; published online: 4 October 2017)

**Abstract:** The European policy of Open Access to scientific research is now one of the key issues discussed in public debates on the future development of scientific communication. The implementation of Open Access tools has significant impact on scientific and economic growth. On the one hand, Open Access accelerates disseminating new research findings and facilitates recognition of authors on a more global scale. On the other hand, Open Access helps provide equal access to knowledge and stimulates innovation. Thus, it has an important role in creating the modern information society and economic growth. International organisations, the European Union and governments of individual countries support the idea of Open Access giving recommendations and guidelines concerning making the outputs of research financed from public funds freely available. The paper aims to discuss the process of preparing and implementing the Open Access policy at the institutional level as well as the functionality and tasks of the Open Repository which is now being established on the Multidisciplinary Open System Transferring Knowledge Platform. The acronym of its name in the Polish language is “MOST Wiedzy”, which means “Bridge of Knowledge”. The repository is a project of an archive of scientific publications, research data, scientific dissertations, as well as other documents and sources, created as a result of scientific experiments and other research and development work conducted at the Gdańsk University of Technology. It will also be a solution supporting communication between researchers and a platform for cooperation between science and business.

**Keywords:** Open Access, Open Science, Open Repository, Open Access Policy, Interoperability, Cloud, Knowledge transfer

**DOI:** <https://doi.org/10.17466/tq2017/21.4/e>

## 1. Introduction

According to Peter Suber, one of the pioneers of the Open Access (OA) Movement: *the basic idea of OA is simple: Make research literature available online without price barriers and without most permission barriers* [1].

Open Access has been defined in three influential public statements: the *Budapest Open Access Initiative* (2002) [2], the *Bethesda Statement on Open Access Publishing* (2003) [3], and the *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities* (2003) [4].

The above mentioned declarations also state that to make the OA work, the copyright holder must consent in advance to let users copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship.

Authors decide whether to submit their work to OA journals (gold OA), or to deposit their work in OA repositories (green OA), and how to use their copyrights. In fact scholarly authors are still largely unfamiliar with their OA options, and they usually transfer all copyrights to the publisher if the default agreement is constructed in this way.

Fortunately, funding agencies and universities are discovering their own interests in fostering OA. These institutions make it their mission to advance research and to make that research as useful and widely available as possible by defining and announcing openness policies.

There are two general types of Open Access policies. One kind of such policy requests or encourages OA. Another one – a stronger kind of policy requires OA or makes it the default. Request or encouragement policies usually ask a faculty to make their work OA, or recommend OA for publications. Sometimes they are called resolutions or pledges rather than policies. These stronger policies are usually called OA mandates [1].

## 2. European and Polish OA Policy

The European Commission (EC) has been implementing OA to research results from projects funded by the European Union (EU) since 2006. Initially, the Commission introduced recommendations, followed at the later stage with a pilot OA programme within the Seventh Framework Programme (7FP).

Finally, the European Commission adopted the *Recommendation of 17 July 2012 on the issue of access to and preservation of scientific information* [5]. In the document the Commission states precisely the policy on Open Access and provides guidelines for the Member States.

The EU's new research and innovation programme for 2014–2020 – Horizon 2020, introduces crucial changes in the area of promotion and dissemination of research results. Horizon 2020 contains the requirement of open dissemination of research results in the form of scientific publications and a pilot programme for dissemination of Open Research Data [6].



The legislative work at the Polish national level and public consultation lasted over a period of a few years. The action, however, did not result in adopting of any legal act. In September 2015 the Polish Ministry of Science and Higher Education issued *Direction for the development of Open Access initiative to scientific publications and research output* [7]. In the document the strategy of OA to scientific content was adopted. The *Direction* presented the guidelines of the OA policy in Poland in terms of access to the scientific research and research output for the research funding bodies (National Science Centre Poland – NCN, National Centre for Research and Development – NCBR), research units, academic schools and publishers. According to the policy it is recommended to publish scientific publications within OA, disseminate the research data openly, establish repositories and carry out training courses on OA. In compliance with the recommendations the research funding institutions as well as universities and research units should define their own terms for Open Access publishing obliging scientists to publish in the OA model.

The Polish Open Access policy will be implemented in line with the Ministry's plans gradually – initially the original assumptions will be realised in the form of recommendations, subsequently OA publishing will be made obligatory. In February 2017 the Polish Ministry of Science and Higher Education sent an open letter, in which the Ministry recommended Open Access to scientific resources. In the document the Ministry called on the heads of scientific units and academic school authorities to implement the Ministry's recommendation in the area of Open Access.

### 3. Open policy of the Gdańsk University of Technology

The Gdańsk University of Technology (GUT) takes into consideration and implements the European Union scientific policy requirements as well as the recommendation of the Polish Ministry of Science and Higher Education.

Since November 2016 the GUT has been implementing a project called Multidisciplinary Open System Transferring Knowledge. The acronym of its name in the Polish language is “MOST Wiedzy”, which means “Bridge of Knowledge”. A very important part of the developed system is the open institutional repository.

The OA policy was prepared, which required some changes to the existing legislation and preparation of new documents. It was necessary to prepare and put into force appropriate legal regulations in the form of new resolutions and recommendations of the Rector of the GUT (regarding documenting and disseminating research results of GUT employees and the obligation to archive doctoral dissertations in the repository). It is also vital to modify the existing documents *e.g.* the principles for the use of intellectual property of the GUT.

The Open Access policy at the Gdańsk University of Technology will be of a depository nature. All publications created by the University faculties will be archived.



By default all publications will be made OA with open licensing. When a publication cannot be made OA due to some legal aspects, it will be treated as a “dark deposit” (the publication will be made OA when the embargo ceases to exist or when there are no other legal objections). Besides, the repository will make it possible to take advantage of the “on demand” option. This function will enable the user to send the author a request for permission to get one-time access to a non-OA publication. The obligation to record scientific achievements in the Repository is going to cover the GUT staff employed on a full- or part-time basis, irrespective of the GUT being their first or subsequent employer, in case a publication is affiliated to the University. The obligation will also cover PhD students employed at the University as well as the faculty members who carry out scientific research.

Depositing publications in the institutional repository will be based on the principle of self-archiving in the process of a person’s research output registration. To register their publication, faculty members should log in to their account on MojaPG (My GUT) platform where they have access to an extensive library of personnel resources procedures. The document must be in the PDF format to be uploaded. The researcher is supposed to choose the type of publication he/she wishes to deposit in the repository – pre-print, post-print and publisher version – and define the type of licence.

Following the stage of providing the publication metadata and content in the repository, the publication undergoes the process of verification and validation.

The University Department of Scientific Affairs is responsible for registration of the research output of the faculty members, transfer of the data to outer systems (*e.g.* POL-on – an integrated system of information on higher education which supports the work of the Ministry of Science and Higher Education, the Central Statistical Office and the Central Commission for Academic Degrees and Titles), verification, validation of the publication metadata and addition of all valid bibliometric elements. At the same time the Library Repository Services Team checks if the publisher’s policy allows deposition of the publication in the institutional repository.

They also make sure that the type and format of the uploaded file are correct. Upon approval, the file of the publication and its metadata are transferred to the open repository. When it is impossible to make the file accessible instantly, its full-text version remains invisible. In that case the MOST Wiedzy platform contains only the metadata, information about the embargo and the “ask for a file” option directed to the authors themselves.

The MOST Wiedzy platform will be also used for performing bibliometric analysis and reporting the research output of the GUT scientific community.

The Repository will be integrated with other databases and information services created at the GUT.

MOST Wiedzy is a project aiming to create archives of scientific publications, scientific documentation, research data, dissertations, as well as other

documents and sources, created as a result of scientific experiments and other research and development work conducted at the University.

Within the platform it is also possible to create authors' profiles. Such profiles will facilitate finding experts and partners in specific areas.

#### **4. Genesis and goals of MOST Wiedzy project**

The MOST Wiedzy project is a continuation of two earlier initiatives implemented by the Gdańsk University of Technology in previous years.

The first project was called “eUczelnia – opracowanie i wdrożenie na Politechnice Gdańskiej platformy udostępniającej eUsługi dla społeczeństwa informacyjnego województwa pomorskiego” (“e-University – development and implementation of a platform providing access to e-services for the information society of the Pomeranian Region at the Gdańsk University of Technology”) [8]. The project was co-financed by the European Regional Development Fund within the Regional Operational Programme for the Pomeranian Region for the years 2007–2013. The project was implemented in the years 2011–2015. Reorganization of many business processes and multiple investments in the IT infrastructure caused a wide-ranging, intensive computerization process of most areas of the University activities. Some dedicated systems and central platforms offering e-services that support business processes of the organization were developed. As a result of that process, many valuable databases were created containing information about the academic potential of the University such as: researchers, their publications and inventions, conducted grants and projects, owned laboratories and research equipment, R&D teams, patents, trademarks and offers for business. Thanks to the centralization of this IT support, it was possible to develop coherent and interrelated databases. This aspect is very important, considering data processing for various purposes such as reporting to the supervisory authorities and management control. The important project results include an e-learning platform called “eNauczanie PG” and a unified, visually consistent web-based content management system (CMS) that supports different types of devices, including mobile devices [9].

The second project was of a more investigative nature. It was conducted by the Academic Computer Centre in Gdańsk (CI TASK) that is located at the GUT. The “C2 NIWA – The Centre of Competence for Novel Infrastructure of Workable Applications” project [10] was co-financed by the European Regional Development Fund within the Operational Programme Innovative Economy for the years 2007–2013. Some IT tools and systems that support open repositories implementation were tested during the project.

As a natural continuation of the above mentioned actions the decision was made to follow the best practices. In this way, in 2016, the Gdańsk University of Technology started the Multidisciplinary Open System Transferring Knowledge project. It is co-financed by the European Regional Development Fund within the Operational Programme Digital Poland for the years 2014–2020. Figure 1 presents the official logotype of the project.



Figure 1. “MOST Wiedzy” project logotype

The main goal of the project [11] is the implementation of a platform that integrates data from many databases of the Gdańsk University of Technology as well as many other universities and research centres. A very important part of the system will be the earlier mentioned open repository of the research papers and manuscripts (OA institutional repository). The gathered data and knowledge will be easily accessible in public, consistent and ready for reuse. The resources will be accessible to business, research community and society in an open, clear and simple form. As a result, a specific bridge that connects academic community with its economic environment (business, non-profit organisations and citizens) will be created.

The MOST Wiedzy platform will provide knowledge to recipients in a quick and intuitive way using an extensive e-service system. In addition to searching and viewing information, the system will have built-in intelligence and some search context analysis mechanisms, which is innovative in our country. Thanks to that the platform will become an intelligent consultant which will suggest the content on the basis of the search history. Moreover, it will automatically detect groups of users and adapt the search results accordingly.

The MOST Wiedzy system is a modern platform that offers multidisciplinary e-services, located in a private cloud of the GUT with a publically accessible universal API. The superior aim of the project is to make the knowledge easily accessible to the information society as well as to stimulate the R2B co-operation. As a result of this co-operation, some new innovations and resources will be produced that will extend the available resources of the platform. The concept of the project is illustrated in Figure 2.



Figure 2. MOST Wiedzy project concept



## 5. Platform architecture, technology and interoperability

The MOST Wiedzy portal [12] is a web-based system running at the central data centre of the GUT and it is accessible via every web browser. The designed architecture of the platform is focused on ensuring a high level of security, availability and dependability. That is why its location has been applied in a private cloud which ensures appropriate redundancy and ease of scaling accordingly to the current system load. It is worth noting that the whole technology stack uses only open-source solutions such as Java, PHP, Kubernetes, WeaveScope and Docker [13]. Figure 3 depicts the overall architecture of the platform.

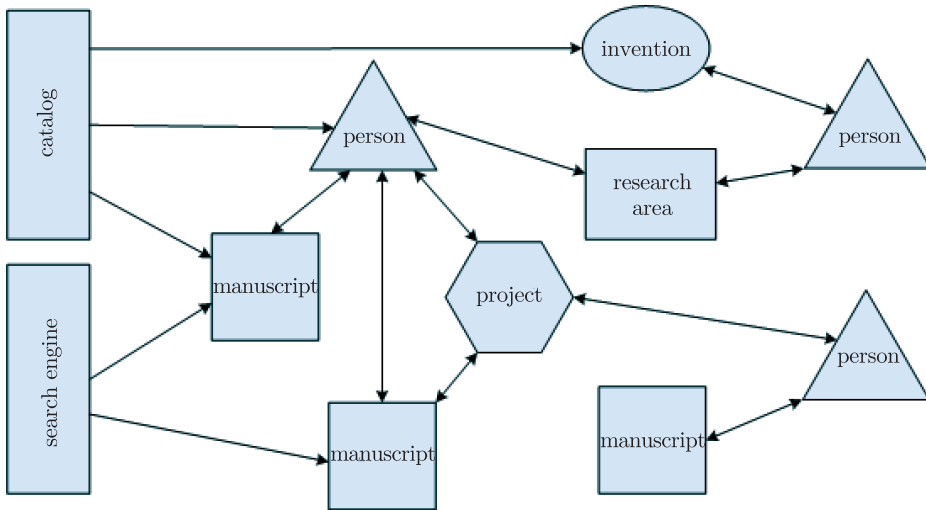


**Figure 3.** Overall architecture of the MOST Wiedzy platform

The whole development process is agile and focuses on User eXperience (UX). According to the user-centred design methodology selected users are engaged at early stages of the development process. Many prototypes of different functionalities are consulted with them. In this way the resultant software should be useful and convenient for them. The implementation of the interface according to the Responsive Web Design (RWD) technique results in the adaptation of the interface to different types of devices (both traditional computers and mobile devices with touch navigation).

Another significant aspect is the organisation of the processed data. The semantic relationships between different objects allow navigating from one object to another easily (see Figure 4). In this way it is very easy to get to know what other publications are written by the researcher, the projects and teams in which the person is involved as well as his/her inventions and research areas. Such an organisation of data supports contextual navigation in the system, easy data analysis and reporting.





**Figure 4.** Contextual organisation of data processed by the MOST Wiedzy platform

Providing the appropriate broadly-defined promotion of resources processed in the MOST Wiedzy platform requires a lot of effort. First of all, if the portal is to be noticeable on the Internet, strong Search Engine Optimisation (SEO) techniques should be involved. Our goal is to appear on the first page of the search results in Google and Google Scholar. Besides, the advanced integration with other systems and repositories is equally important. We are going to integrate with key social platforms dedicated to research such as Mendeley, ResearchGate and ORCID.

Another aspect is actual data retrieval – only an up-to-date database will be interesting to the recipients. The core data is supplied regularly from the transactional systems of our University (developed during the “eUczelnia” project). Another source is the university database of full-text papers. Some data are supplemented from external repositories such as citation indexes from Scopus, WebOfScience, Crossref and Altmetric database.

Data sharing is one of the key functionalities. A publically accessible API allows the data retrieved from the platform to be nested in different external systems and web sites. An illustrative diagram of the above mentioned interoperability is presented in Figure 5.

There are some other equally important aspects of the portal. First of all, it is its accessibility for disabled people. The portal will meet the requirements of the WCAG 2.0 (Web Content Accessibility Guidelines) standard [14]. Secondly, the data processed by the platform will be described by metadata according to the Dublin Core Metadata Initiative (DCMI) Metadata Terms [15]. Moreover, each object will be accessible with a unique address that conforms to the RDF and SPARQL standards. Thanks to that, the data will be understandable for other systems. This aspect allows the MOST Wiedzy portal to be included in the group of “5 Star Open Data” systems [16].



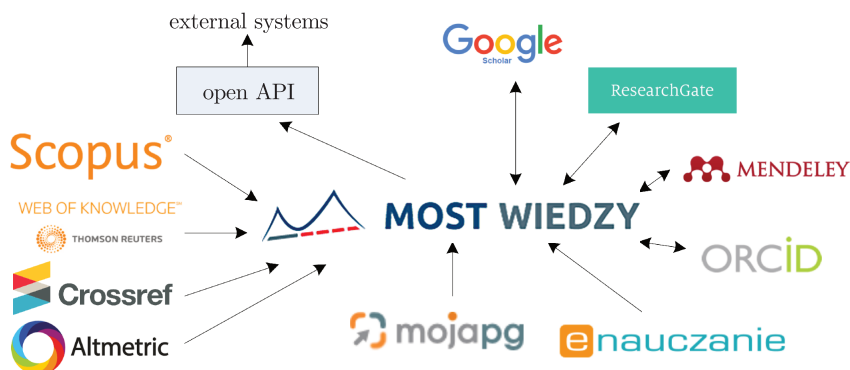


Figure 5. Interoperability of the MOST Wiedzy platform

### Acknowledgements

The manuscript is financed by the “Multidisciplinary Open System Transferring Knowledge” project, No. POPC. 02.03.01-00-0014/16-00.

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