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The inventory and modernization of information resources of the Institute of Geodesy and Cartography

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Abstract: The paper presents the main aspects of resource inventory tasks necessary to develop the OGNIWO system. Special attention was paid to the aspects of modernization and data-sharing and thus to the work which would make it possible to use all data, both using modern tools and from one common platform. The current state of the data, as well as the needs and opportunities for a broader future use of the data were taken into account. The paper presents several main types of modernization work. The scope of the basic characteristics of geoinformation and library resources collected in the system is presented.
An important element in the design of the system was an integration of geoinformation resources with library resources. Due to the fact that it was designed at the stage of creating the metadata, these two resources could be combined.
The way resources were integrated as well as the main functionality of the OGNIWO system were also described. The aim of the work was to ensure consistency between the files and their adaptation for the common and joint use. The effects of the work can be viewed at: http://geozasob.igik.edu.pl

Keywords: geoportal, integration, archival data, digital library, OGNIWO system

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1. Introduction

During the almost 70-year-long activity of the Institute of Geodesy and Cartography (IGiK), numerous information resources have been created and gathered as part of research and commercial projects. Over the past few decades, the IGiK has acquired a number of measurement data, thematic and topographic maps in digital and analogue form, thousands of aerial and satellite images taken at different times, numerous databases containing data at different scales for various regions and saved in formats presenting all stages of the development of spatial databases. These resources, gathered in various places, often completely forgotten, constitute a rich legacy of the Institute and excellent supporting material in the ongoing work, often not available in any other institution. Therefore, it was necessary to develop a system allowing the access to the collected data using a typical web browser without any additional software. Data browse and search should be publicly available and free of charge, not only for the IGiK employees, but also for outside users. For this purpose, it was necessary to analyze the collected resources and consider how they can be made available to the public. The analysis showed that it would be a geoportal (Brzezinska-Klusek et al., 2013).

The inventory and modernization of information resources of the Institute of Geodesy and Cartography reported in the paper was developed under the project “The development of digital geo-information

resources made available within the National System of Geoinformation Science Integrating Geodetic Knowledge – OGNIWO", which was co-funded by the European Funds for Regional Development. It was attempted to make an inventory of all the IGiK's information resources created in its various departments and integrate them into one system, where access would be possible by the Internet by means of a typical web browser. During the project, the challenge was not only to integrate very different resources, but to integrate the resources created over many years, while there was a fundamental change in the form and methods of handling information, including spatial information. The OGNIWO integrates all of the IGiK's information achievements: from traditional analogue forms of data collection and ways of use, to an all-digital form of resources collection and advanced database management systems, as well as library resources. The conceptual idea of the OGNIWO is presented in Figure 1. OGNIWO system is organized in 3 main parts: departmental, central and Internet nodes. Departmental nodes are located in different IGiK's departments and they are sources of OGNIWO data. Central node is dedicated to all IGiK's employees with unlimited access to the all resources. Internet node is for public use. Users have free access for searching metadata and browsing data. After receiving access rights they can have unlimited access to the selected resources.

2. Inventory of the IGiK resources

The project developed a method for inventory the geoinformation and library resources of the IGiK. It was accepted that this inventory, given the character of each type of data, should be carried out in a slightly different way for library resources and geoinformation resources. For both kind of data a resource inventory survey was developed, taking into account two types of information about a resource:

- the basic characteristics of the resource,
- information necessary to modernize and share.

Each resource was defined in detail in terms of information data about the data subject and content, specifications, scope and difficulty of any potential modernization works, and also the copyright and the possibility of their distribution. This information was collected in a survey conducted for each resource by its author, or – if the author is no longer a staff member of the IGiK – other people from the parent unit of the author or another person having knowledge about this resource. The scope of the data included in the survey takes into account the specifics of the data and was developed jointly by representatives of all organizational units of the IGiK which have the described resources.

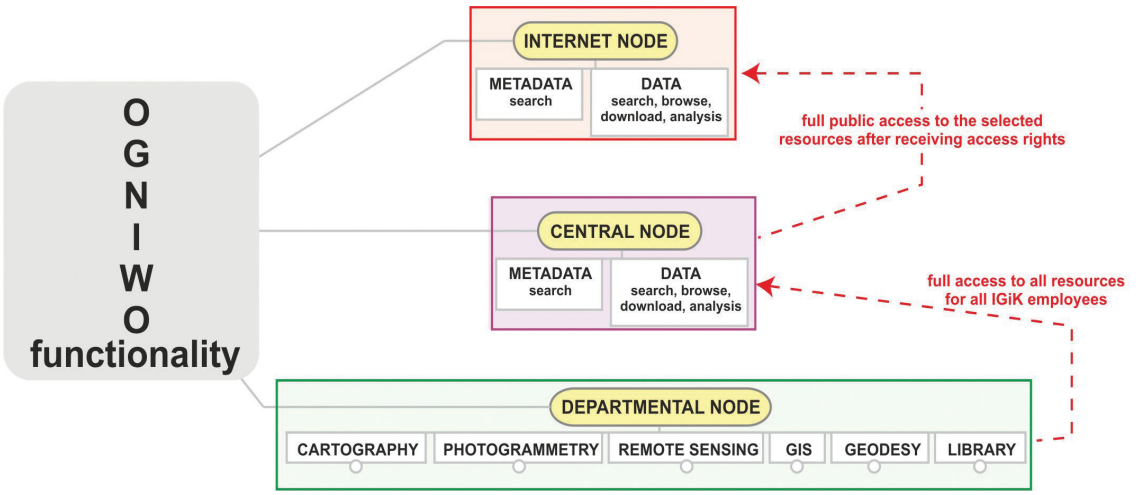

Fig. 1. The conceptual idea of OGNIWO

Table 1. The scope of basic characteristics of the geoinformation resource

Type of information	Explanation of information
dataset title	dataset title that was in the Feasibility Study
dataset topic category	from a pre-defined list, at least 1 category
keywords	minimum 3 keywords in Polish: – one from the GEMET dictionary – one that is associated with the localization – one other
spatial resolution of the dataset	for example: scale (1:scale denominator), terrain pixel size in metres, grid size
geographic location of the dataset	4 pairs of coordinates defining bounding box in current reference system of the resource
coordinate system	coordinate system of the resource
altitude reference system	altitude reference system of the resource (if applicable)
spatial representation type	vector, raster, other
dataset format	it concerns only digital resources
dataset reference date	date of resource validity
dataset history	history and date of resource creation
dataset language	Polish, other
encoding of Polish characters	UTF-8, ISO-8859-2, Windows-1250, other
dataset structure	for digital datasets, mainly vector: a list of layers, types of objects, attributes, and in other cases, basic information about data organization
dataset size	for digital datasets, i.e. 30 images, 100MB each
updating of dataset	is update performed? is update cyclical? update interval
compatibility with official documentation	official name of instruction/document
connection with other datasets	connected dataset name and location
abstract describing the dataset	short description, max. 500 words
dataset responsible party	name of organizational units of IGIK, name of person responsible

2.1. Inventory of geoinformation resources

Geoinformation resources of the IGiK were initially identified at the planning stage of the project and described in the Feasibility Study in Section 3.3.1. Information resources of the Applicant. At the beginning of the project those data were assessed and analysed in detail. The aim was to plan their further exploitation as well as define the architecture and functionality of the planned system (Feasibility Study, 2010).

The scope of detailed information describing the geoinformation resources is shown in Tables 1 and 2.

As a result of geoinformation resource inventory 184 resources were identified.

2.2. Inventory of library resources

The information resources of the IGiK, collected over many years, are not only spatial data but also the library database containing publications in the

Table 2. The scope of information necessary to modernize and share resource

Type of information	Explanation of information
1. Modernization	
• was the resource included in Feasibility Study?	yes/no
• whether the resource will be modernized	yes/no
• the scope of planned modernization	the scope of tasks required to perform the update
• time needed for modernization	man-hour numbers
• does modernization require the purchase of software/hardware?	type and name of software/hardware
• is there a need to conduct training?	type and name of training
2. Copyrights	
• kind of work/subject in which the dataset was created	statutory works, research, EU project, commercial project, other
• name of work/subject in which the dataset was created	if known
• the funding institution (sponsor)	if known
3. Sharing	
• dataset status	known/unknown
• use	interior/public
• repayment	payable/free

field of geodesy and cartography, including publications of IGiK employees, PhD and DSc dissertations, monographs, as well as bibliographic descriptions of publications disseminated over the past few years in various journals and trade magazines. It was agreed that these resources are of great informative value and should be incorporated into the developed system.

However, unlike the previous survey, part I of the survey describing library resources is slightly different and it contains separate information on the metadata (bibliographic) and objects (publications). Part II is the same as in the case of geoinformation resources. The scope of part I information describing the library resources survey is presented in Table 3.

3. Modernization of geoinformation and library resources

Migration of geoinformation data and library resources to the newly developed OGNIWO system required extensive modernization of the majority of the data. The aim of this modernization was technical upgrading, updating and organizing the data into a form allowing a wide use of the resources. As the result, the collections became coherent, and can be together and jointly used in the OGNIWO system.

Many databases maintained by the IGiK operated in a form that prevented their use in the currently functioning software. Neither their direct migration into the OGNIWO system nor a design of a system which could effectively be supplied by data available in IGiK was possible. This concerned mainly archival resources existing in analogue form, in no longer used data formats and coordinate systems that are not supported by current tools. In addition, geoinformation resources were independently developed by many organizational units of the IGiK; they were therefore adjusted – both in terms of form and content – mainly to the needs (former or current) of the departments. One of the external data sources of the OGNIWO is the Geodetic-Geo-

Table 3. The scope of basic characteristics of the library resources

Type of information	Explanation of information
• dataset title	dataset title that was in the Feasibility Study
• dataset topic category	publications of IGIK, other publications, patents, other
• dataset reference date	date of resource validity
• dataset history	history of resource creation
METADATA	
• metadata form	digital/analogue
• metadata quantity	quantity of digital and analogue metadata
• are digital metadata standardized?	yes/no, the name of standard
• metadata structure	existing elements of bibliographic description
• metadata language	Polish/other
• encoding of Polish characters	UTF-8, ISO-8859-2, Windows-1250, other
OBJECTS	
• objects form	digital/analogue
• objects quantity	quantity of digital and analogue objects
• objects format	DjVu, jpg, pdf, txt, other
• objects language	Polish / other
• encoding of Polish characters	UTF-8, ISO-8859-2, Windows-1250, other
• update	
– is update performed?	yes/no
– is update cyclical?	yes/no
– update interval	the frequency of updates
• abstract describing the dataset	short description, max. 500 words
• dataset responsible party	name of organizational units of IGIK, name of person responsible

physical Observatory Borowa Gora which provides GNSS, gravity and geomagnetic data, as well as meteorological data and astrometric observations. They feed the OGNIWO system up to date, and most of them are publicly available to the users (Cisak and Moscicka, 2013). It was therefore necessary to carry out work which would make it possible to use all data, both using modern tools and from one common platform.

Following the evaluation of the resources, 184 basic geoinformation resources and 7 library resources were identified. These resources were divided into three basic groups:

- digital resources ready for use (no need to be modernized) – 48 resources,
- digital resources needed to be modernized – 77 resources,
- analogue resources needed to be modernized – 59 resources.

3.1. Modernization of geoinformation resources

As part of the modernization of geoinformation resources, for each resource, the metadata were developed according to one cohesive profile (ISO

19115). The scope of metadata includes the following (PKN, 2010):

- dataset title;
- dataset reference date;
- dataset responsible party;
- geographic location of the dataset;
- dataset language;
- dataset character set;
- dataset topic category;
- spatial resolution of the dataset;
- abstract describing the dataset;
- distribution format;
- additional extent information for the dataset (vertical and temporal);
- spatial representation type;
- reference system;
- lineage;
- on-line resource;
- metadata file identifier;
- metadata standard name;
- metadata standard version;
- metadata language;
- metadata character set;
- metadata point of contact;
- metadata date stamp;
- unique resource identifier;
- keyword;
- resource type;
- link to library resources.

At the same time the method of recording various pieces of information was defined and the glossary of concepts was created. The passwords and the terms used in the descriptions of resources to characterize the individual properties of the resources (such as keywords) were used to build the dictionary. These passwords were ordered and the method of recording individual names, descriptions and values was standardized. Only the passwords included in the dictionary were used in preparing the metadata for each resource.

The scope of modernization of the various geoinformation resources was defined by the employees of the individual units of the IGIK within the work relating to the identification and description of the resources of the IGiK. The current state of the data, as well as the needs and opportunities for a broader future use of the data were taken into account. The modernization works can be divided into several main types of work, which are as follows:

- data update (1 resource),
- organizing of digital data, their attributes or entire collections/resources (11 resources),
- transformation between coordinate systems or changing data formats, reading from old media, etc. (30 resources),
- complementing the existing data (15 resources),
- georeferencing of digital raster maps (4 resources),
- processing of aerial/satellite images (9 resources).

Many of the geoinformation resources of the IGIK are in the analogue form, including the following:

- paper maps (51 resources),
- slides (5 resources),
- negatives (3 resources).

Modernization of the materials in the analogue form mainly included the following:

- scanning, preceded by defining specific scan parameters for each media type,
- georeferencing: due to the fact that most of the material is archived, georeferencing parameters were determined individually for each of them.

Selected spatial data sets were also harmonized and integrated. The aim of the work was to ensure consistency between the data and their adaptation for common and joint use. The harmonization and integration of resources from different organizational units of the IGiK were carried out by a team of employees, mainly those which the harmonized and integrated resources came from.

3.2. Modernization of library resources

Library resources include 7 databases with varying degrees of metadata digitization and library objects. Digital bibliographic metadata functioned in outdated software, preventing their exchange with other systems and libraries. As part of the OGNIWO system a modern digital library of the IGIK that operates on the basis of dLibra and Weblis software was created.

The dLibra system is currently the most popular operating software for digital libraries in Poland. This software enables sharing of resources among libraries, integration of resources with the largest initiative in this field in the country, the Digital Library Federation, and the largest European initiative that publishes digital resources online – Europeana. Accordingly, both the metadata and library objects were upgraded so as to make it possible for them to directly join dLibra.

Weblis is software that makes it possible to search for a title based on bibliographic data as well to service orders and borrow from the library.

In order to create a modern digital library, all metadata library resources were upgraded. In dLibra the target metadata function in the Dublin Core description standard of digital library resources. This standard is used by dLibra software.

Before modernization, in the library of the IGIK, the metadata functioned in two forms:

- digital in CDS/ISIS standard – in library resources there were 19283 metadata records,
- analogue – in library resources there were 98 analogue data records.

These figures represent the state at the time of the inventory, i.e., the first quarter of 2011.

As part of the modernization the two types of data were prepared for inclusion in the system, including the following:

- the metadata of bibliographic databases were transformed into the Weblis system,
- the metadata of other databases were transformed or developed from scratch in digital format, according to the Dublin Core standard.

In the library resource were also objects (publications) in two forms:

- digital (18805 records) in a variety of data formats,
- analogue – in the resources there were 576 analogue objects.

Modernization of the library resources included primarily digitization, i.e. scanning of analogue publications. Publications that existed in a digital form were transformed into common formats (PDF, jpg, DjVu, etc.) used by dLibra software.

4. The integration of the resources in the OGNIWO system

The last step was to integrate the geoinformation resources in the OGNIWO system and combine them with the library resources. For this purpose, a prototype of the system had to be designed and what was the most important, partition of all resources in such a way that it would be possible to present them from one common platform, the geoportal. The complexity and variability of the data led to the allocation of resources in three main groups associated with specific data, and thus the way of their presentation: geospatial data possible to display on the digital map background, a series of measurement data, and unprocessed satellite images" (Brzezinska-Klusek et al., 2013). The first group included all data in vector form, aerial and satellite images. The other groups comprised series of measurement data, or data in tabular form or graphs, as well as historical maps for which the georeferencing, without distortion, was extremely difficult. Therefore, it was decided not to geometrize them.

This partition was directly connected with the presentation of resources, but the place containing the metadata of all resources collected in the IGiK was also designed in the geo-portal. The search by series, set or service is possible, as well as the search by keywords. The user can also choose an area from the map and associated data available inside this area will be searched. The search result displays a table of available resources that meet the specified criteria. After selecting one of the items more detailed information about a specific resource will appear. In this table, which is also available from the map, there is also information about the publications from the library, thematically related with the resource. These items operate as a link to the selected publication. This is a very important feature, because it allows publications to be displayed in PDF format directly from the map (Brzezinska-Klusek et al., 2013).

5. Summary

The large number of informational resources of the IGiK, the huge effort connected with modernization, and the time constraints resulting from the project implementation schedule made it impossible to include all resources as initially planned. Given the time and means allocated for the modernization of library and geoinformation resources, analysis of the resources and the work necessary to modernize them were carried out. The analysis showed those resources that should necessarily be integrated into the OGNIWO, often despite considerable investment for their modernization. The basis for the selection of resources for modernization and integration into the OGNIWO were as follows:

- the scope of the modernization of each resource,
- the time needed to complete the modernization of an individual resource,

- the time taken for the modernization of the resources in the work schedule of the OGNIWO project,
- the planned cost of resources modernization,
- the held copyright for the sharing of resources.

In its final form the OGNIWO includes the following resources:

- digital resources that were not modernized, ready for direct integration into the system;
- digital and analogue resources that should be modernized (regardless of the work and time needed), which arouse users' interest;
- analogue and digital resources for which the IGiK has public distribution rights;
- digital resources that require a small amount of modernization work, which may be distributed only within the IGiK;
- library resources, regardless of the work and time needed to modernize them (due to their specifics).

Some resources were excluded from the modernization work, and thus from the OGNIWO system. These were resources that required a large amount of modernization work and time needed to carry it out, resources that are not interesting to the users and at the same time the IGiK does not have public dissemination rights. The effects of the work can be viewed at: http://geozasob.igik.edu.pl

Acknowledgements

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Inwentaryzacja i modernizacja zasobów informacyjnych Instytutu Geodezji i Kartografii

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Streszczenie: W artykule przedstawiono główne aspekty zadań inwentaryzacji zasobów niezbędnych do opracowania systemu OGNIWO. Szczególną uwagę poświęcono także modernizacji i wymianie danych,

a zatem pracom polegającym na umożliwieniu korzystania ze wszystkich danych zarówno za pomocą nowoczesnych narzędzi, jak i z poziomu jednej wspólnej platformy. Uwzględniono przy tym zarówno obecny stan danych, jak i potrzeby oraz możliwości przyszłego korzystania z danych w szerszym zakresie. W artykule przedstawiono kilka głównych rodzajów prac modernizacyjnych. Zaprezentowano zakres podstawowych charakterystyk zasobów geoinformacyjnych i bibliotecznych, zgromadzonych w systemie.
Przedstawiono ważny element w projektowaniu systemu jakim było połączenie zasobów geoinformacyjnych z zasobami bibliotecznymi. Z racji tego, iż zaprojektowano to już na etapie tworzenia metadanych, można było te dwa zasoby ze sobą połączyć.
Opisany został również sposób integracji zasobów wraz z główną funkcjonalnością systemu OGNIWO. W ramach tych prac podjęte zostały działania mające na celu doprowadzenie do wzajemnej spójności zbiorów oraz ich przystosowanie do wspólnego i łącznego wykorzystywania. Efekty prac można obejrzeć pod adresem: http://geozasob.igik.edu.pl

Słowa kluczowe: geoportal, integracja, dane archiwalne, biblioteka cyfrowa, system OGNIWO

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- books:

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- multi-author books (proceedings):

Rummel R., (2000): *Global unification of height system and GOCE*, in: M.G. Sideris (ed.), Gravity, Geoid and Geodynamics 2000, IAG Symposia, Vol. 123, Springer, pp. 13–20.

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