

Promoting the Ukrainian Education and Culture Centre “Oseredok” through the digitization of Ukrainian Studies archival collections in Canada

Ivan Khoma, Nataliia Vovk, Roman Holoshchuk and Svitlana Muravska

Lviv Polytechnic National University, Stepana Bandery Str. 12, Lviv, 79013, Ukraine

Abstract

The article discusses the key issues of digitization of archival collections of Ukrainian studies located outside Ukraine. In particular, detailed attention is paid to the Ukrainian Education and Culture Centre “Oseredok”, which has one of the largest archives of Ukrainian studies in Canada. The researchers argue that the digitization of these collections will help to bring hundreds of thousands of unknown materials. Modern scholars for humanitarian circulation and to introduce hundreds of famous Ukrainians and their cultural, political, educational, scientific, and artistic heritage need these materials. The study develops and presents a functional and information modelling of promoting the Ukrainian Education and Culture Centre. Such modelling is the theoretical basis for further digitization of these funds, which allows not only to popularize of the modelling activities but also to increase the number of new users and researchers of Ukrainian history.

Keywords

Digitization, electronic archives, foreign Ukrainian studies, funds of the Ukrainian National Revolution in exile, functional and information modelling.

1. Introduction

One of the most relevant areas of development and preservation of cultural values is digitization of archival collections. It means the conversion of paper documents, photographs, audio and video recordings, maps, and other artefacts into digital format to ensure preservation, accessibility, and ease of use of these materials. This process has great importance for cultural heritage preservation, research, education, and interaction with history. The digitization of archives contributes to the preservation and promotion of valuable cultural resources, facilitates research, and promotes broad access to historical documents and other materials.

The main reasons for accelerating the digitization of archival collections include many things. There are preservation and storage (digitization allows for the creation of digital copies that can be stored in a secure electronic environment); ease of access (digital archives can be easily searched, browsed, and organized, making it easier for researchers, students, teachers, and others interested in studying cultural heritage); promotion (digitization allows for making cultural heritage accessible and visible to a global audience on the Internet and other electronic platforms). There also is research (digital archives allow researchers to conduct research faster and more efficiently, collect data, compare materials, and use them for analysis); education (digital archives can be used in educational programs to teach students and schoolchildren about history, culture, and other aspects of society). Preservation of languages and cultural traditions (digitization can help preserve the diversity of languages and cultures that may be lost over time); open data and innovation (digital archives can be used to create new works of art,

SCIA-2023: 2nd International Workshop on Social Communication and Information Activity in Digital Humanities, November 9, 2023, Lviv, Ukraine

EMAIL: ivan.y.khoma@lpnu.ua (I. Khoma); nataliia.s.vovk@lpnu.ua (N. Vovk); roman.o.holoshchuk@lpnu.ua (R. Holoshchuk); svitlana.i.muravska@lpnu.ua (S. Muravska)

ORCID: 0000-0003-4607-7065 (I. Khoma); 0000-0002-2470-7188 (N. Vovk); 0000-0002-1811-3025 (R. Holoshchuk); 0000-0003-4971-7312 (S. Muravska)



© 2023 Copyright for this paper by its authors.
Use permitted under Creative Commons License Attribution 4.0 International (CC BY 4.0).
CEUR Workshop Proceedings (CEUR-WS.org)

applications, interactive projects, and other innovations); collaboration and knowledge sharing (digitization will facilitate cooperation between different institutions, countries, and groups, allowing for the exchange of knowledge and resources) are also in this list of reasons.

An important fund of Ukraine's cultural heritage to be digitized is the archival materials of Ukrainian studies stored at the Ukrainian Education and Culture Centre (Winnipeg, Canada). The archives of the Centre contain collections of famous Ukrainians, Ukrainian institutions and organizations and contain valuable information on the history of the Ukrainian Revolution of 1917-1921, Ukrainian diplomacy, interwar and postwar emigration, and the cultural and social life of Ukrainians in Canada.

2. Analysis of literature data and problem definition

The issue of digitization of archives is currently considered in the works of many scholars in various fields: history, software, geography, ontology, etc. The geography of researchers is quite wide – countries of Europe, Asia, the USA, etc. They consider the digitization of collections (including archival, museum, and library collections) from different perspectives, focusing on various important factors: sources of the search for these collections, selection of the optimal software, methods, and means of digitizing materials, forms of digitization and publication of digitized materials, etc.

To select the theoretical basis of the study, we have chosen the works of recent years that present practical solutions for the digitalization of archival collections and other various primary documents. It is based on the work of foreign researchers who have developed various models of digitalization. It is worth noting that there is a small number of researchers from Ukraine who focus their research on digital communications between archives and the public.

The comprehensive study "Use and Reuse of the Digital Archive", edited by Potts J., presents the use and reuse of digital archives, combining theoretical and practical approaches to the modern digital archive. Several chapters of the study describe the process of creating a digital archive using specific examples – digitizing a physical archive and creating a searchable digital database as the core of a digital archive. Other chapters explore the cultural significance of digital archives in more general theoretical terms. In particular, the following areas are presented in a comprehensive study: specific properties of a digital archive; its similarities and differences from a traditional paper archive; ethical decisions made in the design of the archive; and the potential for creative reuse of archival materials archived on the Internet [14].

Paul Peucker in his book "The Role of the Archives in a Digital World" argues that digitization has increased the accessibility of archival collections. At the same time, digitization not only changes the relationship between archivists and researchers but also changes the way documents are described. The author argues that in order to remain relevant, archives need to diversify their programs and become centers of expertise [16].

Hawkins A. looks at archival data from the perspective of digital humanities, extrapolating research from archival and digital humanities in the field of linked data to identify the benefits of digital humanities in creating and providing access to archival-linked data. In the study, the author examines some of the current barriers that prevent digital humanists from experiencing the benefits of archival data and making full use of archives that have become available in digital format. The researcher argues for increased cooperation between the two disciplines. He proposes to incorporate artificial intelligence and low-barrier tools such as Wikidata into the linked data production workflow in order to scale up the production of archival data as a means of increasing access and use of digitized and newly created digital archives [1].

The challenges associated with the production and publication of archival-linked data are relatively well documented and include:

- technological problems;
- the prevalence of unstructured data that is difficult to distinguish;
- lack of financial and qualified human resources;
- low level of awareness of linked data within the profession;
- lack of archival-linked data infrastructure, including tools, standards, and best practices.

Challenges to which archival and digital humanities scholars and practitioners are jointly seeking solutions include:

- balancing the provision of access to open data with respect for intellectual property rights;
- preventing the decontextualization and loss of nuances of archives;
- providing access without complicating the search process for users.

As a growing number of case studies demonstrate, many challenges can be overcome with the development of archival-linked data practices. Moreover, recent large-scale projects have begun to provide some foundational ones [1].

Jan de Mooij and others argue that as a result of the constant generation of new data sources in the humanities, it is now possible to find patterns in data sources from archives, museums, and other cultural heritage institutions. Despite similar activities, these institutions use different digitization strategies. This is justified by differences in selection procedures. This leads to heterogeneous data sources, which has a huge impact on the accessibility and interoperability of data within and between these distributed collections. The researchers identified three interrelated challenges that users may face when querying such distributed data sources, including:

- query formulation;
- selecting a source;
- reconciliation of data sources.

Fig. 1 shows a multi-agent architecture to overcome these problems [13].

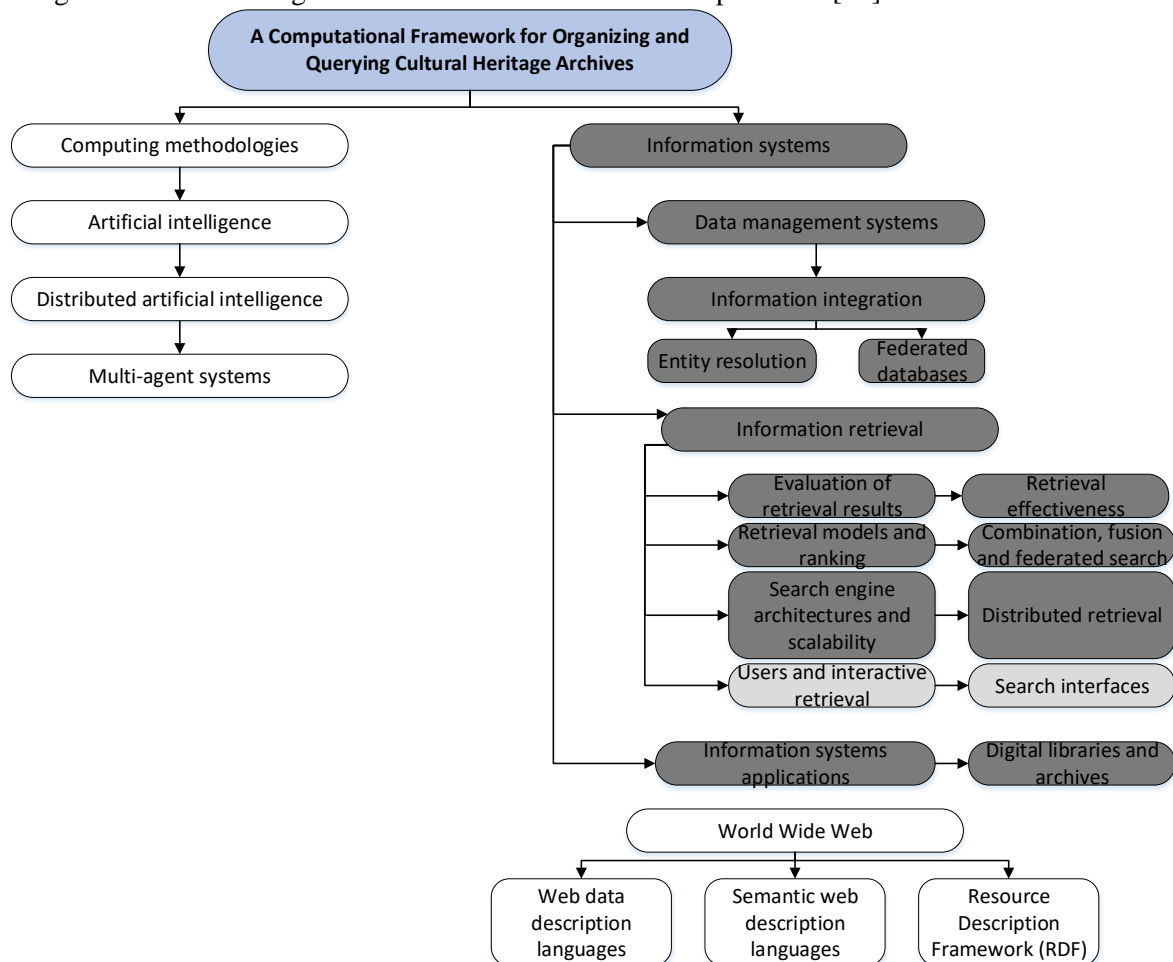


Figure 1: A Computational Framework for Organizing and Querying Cultural Heritage Archives
 Source: J. de Mooij, C. Kurtan, J. Baas, M. Dastani. A Computational Framework for Organizing and Querying Cultural Heritage Archives, volume 15 of Journal on Computing and Cultural Heritage, 2022. doi: 10.1145/3485843

Mezzino D. and others have devoted their research to the methods of digitizing the photographic archive of a museum collection. In this context, the digitization process plays a crucial role in the development of customized documentation and representation strategies for consultation and management of the museum archive. This study highlights the role of the archive as a historical

memory, capable of transmitting the transformations in methods and techniques of documentation and representation between the nineteenth and twentieth centuries. The management of the digitized archival materials was realized with the help of special software that automated and streamlined the work. The photographic archive was published using a special web platform, The Photographic Archive of Museo Egizio. In this process, the role of representation was fundamental in the research, interpretation, and communication of this rich and little-known archive, activating further processes of knowledge that can enrich the understanding of cultural heritage [6].

In recent years, there has been a trend towards synergy between cultural heritage institutions, for example, the cooperation of GLAM (Galleries, Libraries, Archives & Museums) in the field of information resource management. These institutions actively promote the creation of digital humanitarian projects. Such projects are primarily aimed at creating information resources and providing digital humanitarian services that correspond to the service functions of GLAM institutions. At the technical level, methods such as knowledge graphs and ontologies are used to build a multi-level and systematic knowledge system. The study by Liu F. et al. provides an overview of three models of cultural heritage - CIDOC CRM, Europeana and Sampo Model, and considers three aspects of these models: building a technical structure, digital resources, and service systems [9].



Figure 2: CIDOC CRM family of Models

Source: F. Liu, J. Hindmarch, M. Hess. A review of the cultural heritage linked open data ontologies and models, volume 48 of International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 2023, p. 943. doi: 10.5194/isprs-Archives-XLVIII-M-2-2023-943-2023



Figure 3: Sampo Model based on a shared ontology

Source: F. Liu, J. Hindmarch, M. Hess. A review of the cultural heritage linked open data ontologies and models, volume 48 of International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 2023, p. 944. doi: 10.5194/isprs-Archives-XLVIII-M-2-2023-943-2023

A comprehensive system for effective documentation, management, and updating of cultural heritage knowledge is needed at the country level. An integrated cultural heritage information system can visualize the country's cultural heritage and act as an interactive multimedia documentation system. Virtual recreation of cultural heritage hastily can also ensure its long-term sustainability. A digital archive of different expression forms will become a rich source of data for research, administration, and development. The developed archive should cover cultural heritage in the form of published documents, images, audio and video materials, documents and visual materials about performing arts, buildings, sculptures, ecosystems, monuments, utensils, etc., as well as the history and knowledge related to them, and any other property belonging to the heritage [18].

Analyzing the models depicted in Figures 1-3, the multi-agent architecture model is optimal for solving the tasks of the article, since this model most fully reveals the main directions of transformational work related to the digitalization of archival collections.

Regarding the issue of digitalization of Ukrainian archival collections, it is worth mentioning the study by Sojka-Masztalerz H. and Szala M. The subject of this paper is archival materials collected in two inventories, which are personal files of the former Lviv University staff. The digital copies of these resources are part of the digital GLAM. It is a digital service created at the University of Wroclaw based on the cooperation of various institutions (archives, libraries, museums, and archives) that make their digital collections accessible through standardized description and presentation. GLAM member institutions use, among other things, the IIIF (International Image Interoperability Framework) standard. This standard enables the dynamic exchange of digitized objects, and the Virtual Transcription Laboratory (WLT), a cloud-based tool that allows the creation of a text layer as a result of automatic recognition (OCR) or using manual transcription tools [10].

The paper by Tiurmenko I. et al. analyses the transformations that have affected the archival sphere of Ukraine in the context of the formation and development of the digital society. In particular, the paper analyses the use by archival institutions of such tools as blogs, social networks, search engines, websites, and tags, which are aimed at developing customer-oriented and image technologies. Special attention is paid to the organization of full-text online access to documentary information, project activities, and partnerships. They are an important tool for implementing the digitization policy to implement the digital communications strategy [12].

3. Background to the emergence of Ukrainian studies centres abroad

Due to the very complex state-building and national liberation processes on the Ukrainian lands during the twentieth century, tens of thousands of representatives of the Ukrainian political, military, spiritual, public, scientific, educational, and cultural elite were forced to leave Ukraine. They were mostly fleeing the communist totalitarian regime that occupied the whole of Ukraine from the end of 1918 until the end of 1944. There were those who could not live in western Ukraine in the interwar period, which was part of Poland. When they went into exile, they took, among other things, documents of various contents. After establishing themselves in a particular country, they began to carry out active work, and thus accumulate new documents: scientific works, memoirs, letters, passports, residence permits, medical records, police calls, travel tickets, financial documents, etc. This invaluable and limitless source base is unknown and inaccessible to most contemporary Ukrainian researchers.

After the Second World War, realizing the threat to life posed by the activities of the Soviet secret services in Europe, many Ukrainian figures began to move to the United States and Canada. Some moved to Australia, Argentina, Brazil, and other countries far from the European continent. Those who managed to continue to live safely in Europe, in their old age, began to transfer the accumulated materials overseas or their relatives and friends did so. It was believed that storing documents in the United States or Canada was safer.

As a result, millions of documents and tens of thousands of different artefacts have accumulated in these countries. Separate storage centers were formed around this, or these materials ended up in university libraries, city archives, etc. At present, we know about almost all the centers where Ukrainian literature is stored in the United States and Canada [2, 3, 15]. Moreover, we know about the materials stored in these libraries and archival centers. Since independence, a few researchers have had the

opportunity to work with these materials. However, their accessibility to the general research community remains an obvious problem.

It would be a mistake to say that these materials are a complete mess. The staff of such centers has properly organized them, i.e. divided them into funds, collections, and periodicals, and described them. However, there are often no descriptions of the funds, which are familiar to Ukrainian researchers.

4. The state of access to Ukrainian studies abroad

The issue is that the vast majority of documents have not been digitized, and there is no hope that this will be implemented in the near future. A very good example of digitization is the activity of the Organization of Ukrainian Nationalists Archive of the Ukrainian Information Service (OUNA UIS) in London. Many collections from the United States and Canada have been transferred here. The official website of the OUNA UIS shows how the work is structured. In particular, the digitized printed, written, audio, and video materials are divided into appropriate blocks, with various document collections separated and a separate group for the library. Each of these structures is divided into relevant groups [4].

The person responsible for this work is a professional historian and archivist, former director of the State Archives of Sumy Oblast, and co-founder of the Centre for the Study of the Liberation Movement, Hennadii Ivanushchenko. In an interview posted on the Historical Truth website, he notes that the digitized documents have been posted since September 2012 [17].



Figure 4: Site structure of OUN Archive in London

Another good example is the Electronic Archive of the Ukrainian Liberation Movement. The staff of the Library of Ivan Franko National University of Lviv and the Centre for the Study of the Liberation Movement are working on its development [4]. The focus of this project is on digitizing archival documents from Ukrainian archives. Accordingly, the structure of the electronic archive is linked to various Ukrainian state archives.



Figure 5: Structure of the Electronic Archive of the Ukrainian Liberation Movement

5. The Ukrainian Cultural and Educational Centre “Oseredok” in Winnipeg: Establishment and current state of access to materials

One of the largest repositories of documents, photographs, and videos is the Ukrainian Cultural and Educational Centre (UCEC) in Winnipeg, Canada, founded in 1944. It included documents of famous Ukrainians who spent a significant part of their lives in Winnipeg. In particular, conductor and composer O. Koshytsia and church historian, bishop, and linguist I. Ohienko lived here. After their deaths, the accumulated materials were transferred to this center. A collection of photographs, photo negatives, and written documents of I. Bobersky appeared here in another way. It is believed that his collection was the first to be transferred to the Ukrainian Cultural and Educational Centre and initiated the formation of the archive [3]. He lived in Winnipeg from 1922 to 1932. After returning to Europe in 1932, he left the documents, related to his activities as a representative of the West Ukrainian People's Republic and photographic materials in Canada. After the Second World War, he sent other documents accumulated since 1932 to the Ukrainian Cultural and Educational Centre.

The experience of establishing the E. Konovalts Foundation in the UCEC is different. It is known that he was murdered by the Soviet secret services on 23 May 1938 in Rotterdam. Before his murder, Konovalts lived in Rome with his wife and son. After the Second World War, his wife worried that the documents accumulated during her time in exile might be stolen, destroyed, or taken to the Union of Enslaved Nations, sent them to Winnipeg in 1948. Here they were properly described and arranged [20]. This woman also transferred a small library of E. Konovalts to Winnipeg.

Many of the UCEC collections consist of materials from various Ukrainian spiritual, educational, social, economic, publishing, and other organizations that functioned in Winnipeg and ceased to exist [2].

An obvious drawback that complicates the centre activity is that the materials are not fully organized, in addition to being divided into different funds. There are no descriptions of the collections, no catalogues, and no other important tools for systematic work in the library and archive. When researchers work with the personal collections of I. Boberskyi, Y. Konovalts, D. Andrievskyi, M. Seleshko, and Y. Onatskyi, they had to go through all the materials to select the necessary information (from Ivan Khoma's personal experience).

In the modern information world, digitizing can improve the access to these materials. It can be done according to the examples above or by developing an independent methodology. It is noteworthy that the UCEC Oseredok participated in one such project. Furthermore, it was back in 2005-2006. Then Oseredok together with the Archives and Special Collections of the University of Manitoba and the University of Saskatchewan Archives joined the web project "The Prairie Immigration Experience 1900-1950". According to the compilers of Archival Ukrainian Studies in Canada, 300 photographs, posters, and documents from the collections of I. Bobersky, O. Kosice, Drs. P. Matsenko, D. Lobai, M. Lekhiv, St. Raphael's Ukrainian Immigrant Society in Canada, the Canadian Ukrainian Athletic Club, and Charles Photo Studio were digitized [2]. This project continues its life online, but it is outdated, and inconvenient now [19].

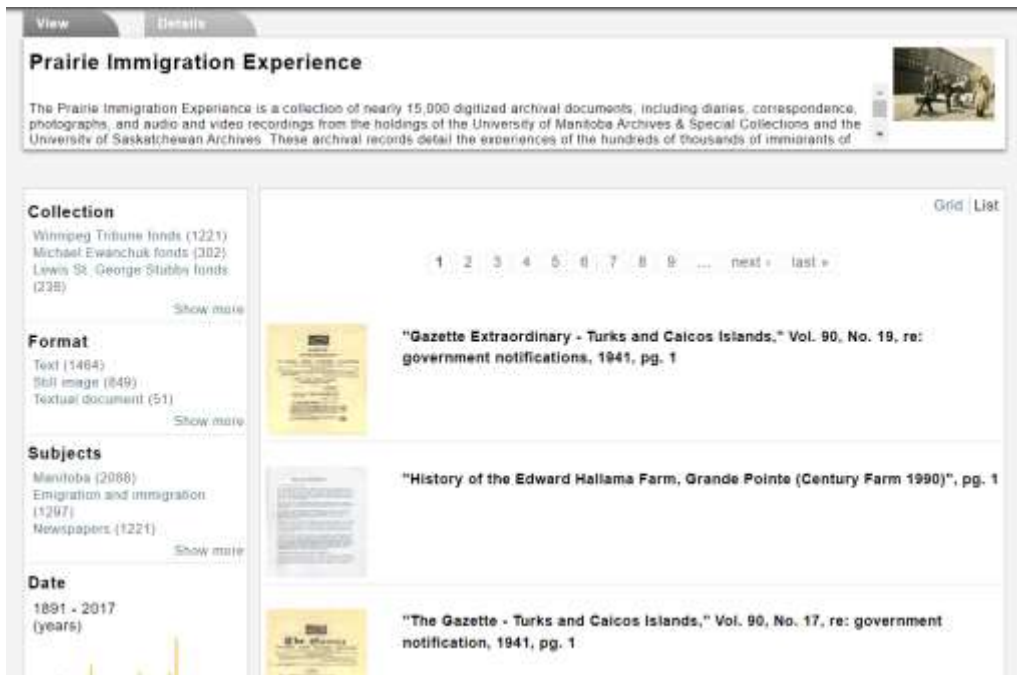


Figure 6: Image of digitized documents from The Prairie Immigration Experience 1900-1950, including materials from the Ukrainian Cultural and Educational Centre

The official website of the UCEC shows some attempts to digitize the collection. In particular, there is an online catalogue, which currently contains some digitized materials from the collections of I. Boberskyi and O. Koshytsia. It can be assumed that in the future the online library will also be updated. However, it is not clear whether it will be a catalogue or an electronic version of digitized publications.



Figure 7: Modern interface of the online archive structure of the Ukrainian Cultural and Educational Centre

Today, there are two of the best resources of digitized Ukrainian historical and general literature. It is about the website "DIASPORIANA.ORG.UA" [8] and "Chytyvo. Electronic Library" [7].

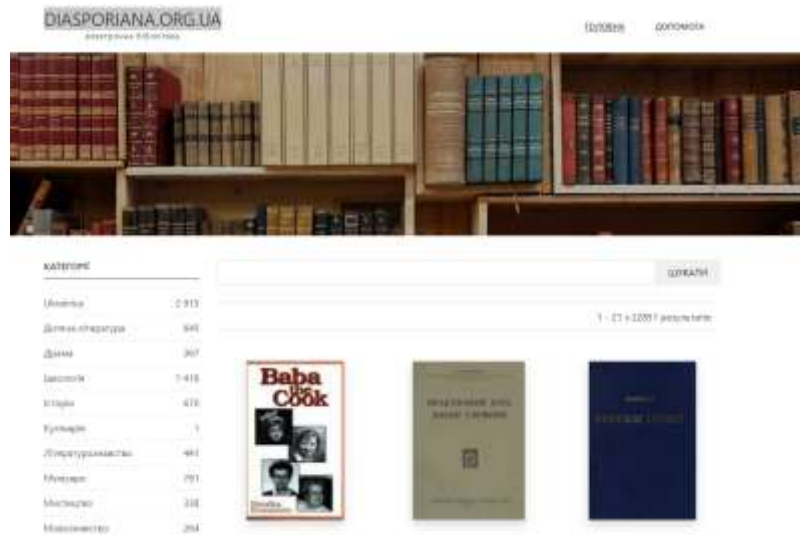


Figure 8: The structure of digitized Ukrainian diaspora literature



Figure 9: The structure of digitized Ukrainian scientific, art, and other literature

Similarly, it is advisable to develop an online archive of the UCEC, following the model of the powerful resource of sources and materials of the OUN Archives in London.

6. Functional and informational modeling of the process of promoting the Ukrainian Education and Culture Centre

For the functional modeling and graphical description of the process of promoting the Ukrainian Education and Culture Centre through the digitization of Ukrainian studies archival collections in Canada, it is advisable to use the IDEF0 methodology. The four sides of the block have different meanings: the left side has the meaning of "input" – information flows Information about the Centre, Materials for digitization, and User requests; the right side has the meaning of "output" which reflects elements of promotional activities: Posts, Information about new digitized publications, etc.; the upper side is "management", which is limited to the documents of the regulatory framework; the lower side is "mechanism", which is carried out by the Digitization Specialist, PR Manager and the User of the official website.

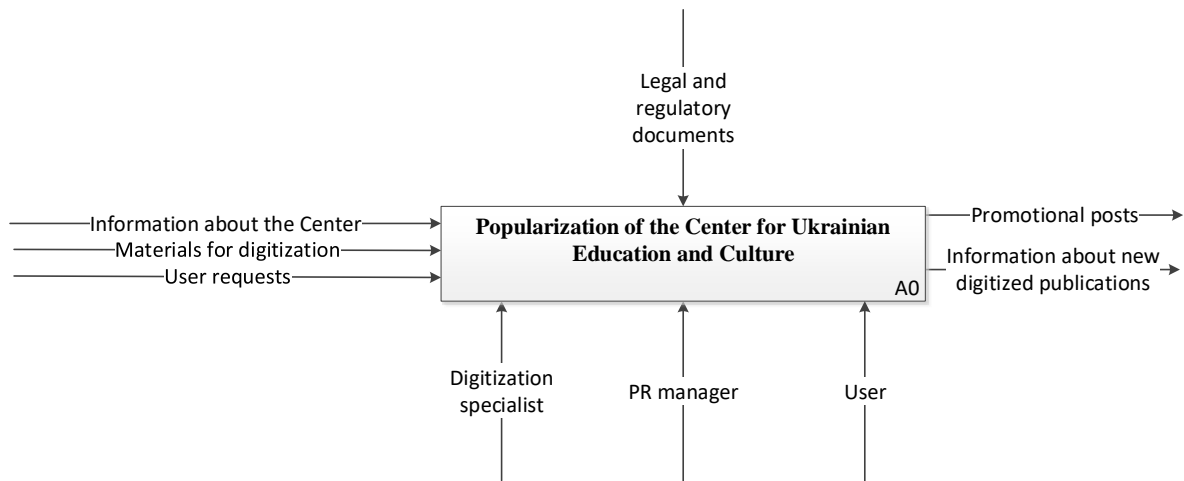


Figure 10: Context diagram IDEF0 of the process of promoting the UCEC through the digitization of Ukrainian studies archival collections

To display the process of receipt and processing of documents, we use Dataflow Diagrams (DFD). They are one of the main tools for information modeling of functional requirements for the designed system. System requirements are presented in the form of a hierarchy of processes connected by data flows. Data flow diagrams illustrate how each process converts its input data into output data and identify the relationships between these processes. The DFD methodology is successfully used to describe document flow and information processing and can be used for information modeling.

The main purpose of DFD tools is to demonstrate how each process converts input data into output, as well as to identify the relationships between these processes. The result of building a functional model of a system is a hierarchy of DFDs that describe the asynchronous process of transforming information from its input to the system to its output to the user [5].

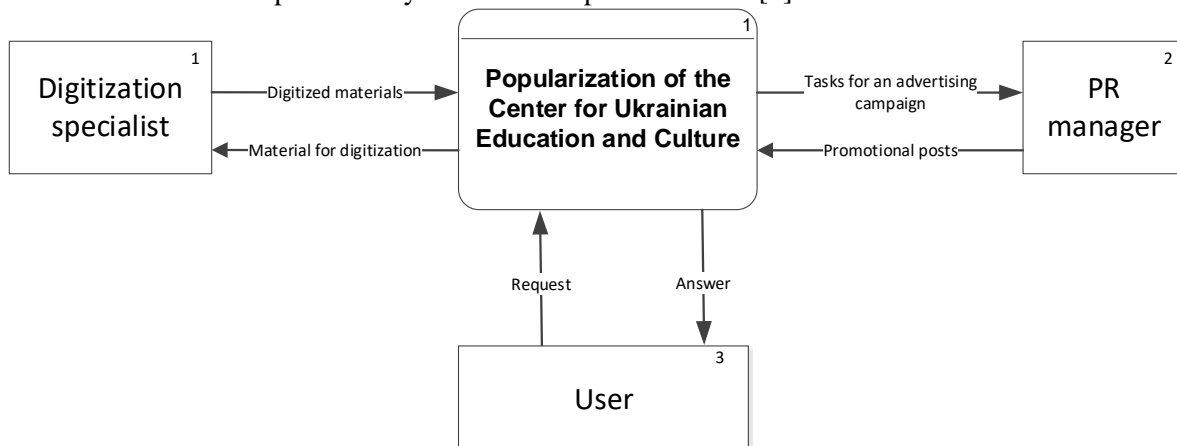


Figure 11: Contextual diagram of the process of promoting the Centre for Ukrainian Education and Culture through the digitization of Ukrainian Studies archival collections

The main process of the context diagram is the process of promoting the UCEC through the digitization of archival collections of Ukrainian studies. It consists of digitizing and processing various types of materials and publications, posting their electronic versions on the official website of the Center, and conducting promotional activities to attract new users.

The context diagram shows three external entities: the Digitization Specialist, the PR Manager, and the User of the official website.

Figure 11 shows the model of interaction between the Digitization Specialist, the PR Manager, and the users. The aim is to support the advertising activities of the UCEC and to promote the online archive with digital copies of archival materials. According to the model, users receive general information

about the activities of the Center, view digitized materials, and can submit their requests (comments, questions, etc.).

7. Perspectives of future research

Using the proposed theoretical model for the complete digitization of the archival collections of the UCEC, it is advisable to analyze and use the following digitization technologies in more detail:

- automatic scanning of documents: use of scanners to convert paper documents into digital format (automatic document feeder (ADF) and double-sided scanning);
- Photography: for objects that cannot be scanned, digital cameras or smartphones can be used to take high quality photographs of objects that can then be stored digitally (flatbed scanning);
- audio and video digitization: for audio and video recordings, special devices should be used to convert analogue sound or video into digital format; this will be useful for digitizing old audio and video recordings, such as pre-amplified audio and video interfaces for analogue sources, which help ensure proper recording quality;
- optical character recognition (OCR): for scanned documents whose text needs to be recognized and converted into editable digital text, it is advisable to use OCR technology;
- digital archiving: digitized data can be saved in various digital formats such as PDF, JPEG, MP3, MP4, etc. It is important to choose the appropriate formats based on the purpose and storage of the data;
- processing and preservation of metadata: during digitization, it is important to preserve information about objects (metadata) that describes their origin, date, author, etc. This will help to preserve the context and convenience for further use;
- cloud storage and backup: digitized archives can be stored in cloud services or backed up to external media to ensure data security and availability.

These technologies can be combined to ensure the best possible outcome for digitizing the Branch's archives, taking into account specific needs and constraints.

8. Conclusion

The digitization of the Ukrainian Canadian archives as part of the Ukrainian Cultural and Educational Centre “Oseredok” is a significant initiative to preserve the historical and cultural heritage of the Ukrainian people. This allows for preserving and making available to researchers, the public, and the younger generation documents, photographs, audio and video recordings that testify to the life and work of Ukrainians around the world. The main aspects of digitization of the Centre's archival collections are as follows:

- cooperation with archival institutions: digitization of Ukrainian archival collections may be carried out jointly with other archival institutions. This may include partnerships with local archives, libraries, and cultural organizations;
- digitization of documents and photographs: scanning and digitization of paper documents, photographs, newspaper articles and other materials of the Center will allow preserving them in digital format and making them available for research and public use;
- audio and video digitization: it is important to digitize audio and video recordings containing testimonies, interviews, musical performances and other important aspects of the life and culture of the Ukrainian people;
- creation of an electronic archive: the main task of the electronic archive will be to store and organize the digital archival materials of the Centre. It may include platforms for searching, viewing, and researching documents;
- online access: the digitized archives can be placed on the Internet, providing access to it online. This allows researchers and the public from all over the world to study and use these materials;
- metadata preservation: It is important to create detailed metadata for digitized materials to provide context and traceability;

- the digitized archives of the UCEC will become an important resource for research, education, and preservation of the cultural heritage of the Ukrainian people living abroad.

Adding digital copies of materials from the archival collections of Ukrainian studies in Canada to the online archive will help promote the activities of the UCEC, and increase the number of new users and researchers of Ukrainian history.

9. References

- [1] A. Hawkins, Archives, linked data and the digital humanities: increasing access to digitised and born-digital archives via the semantic web, *Archival Science* 22 (2022) 319-344. doi: 10.1007/s10502-021-09381-0.
- [2] Archival materials on the history of Ukraine in Canada: Preliminary annotated list [Arkhivni materialy z istorii Ukrainy v Kanadi: Poperednii anotovanyi perelik], in: B. Kravchenko (Ed.), Kyiv, Edmonton, 1990. URL: <https://archives.gov.ua/ua/%D0%B0%D1%80%D1%85%D1%96%D0%B2%D0%BD%D1%96-%D0%BC%D0%B0%D1%82%D0%B5%D1%80%D1%96%D0%B0%D0%BB%D0%B8-%D0%B2-%D0%BA%D0%B0%D0%BD%D0%B0%D0%B4%D1%96/>. [in Ukrainian]
- [3] Archival Ukrainian Studies in Canada: a reference book [Arkhivna ukrainika v Kanadi: dovidnyk], in: I. Matiash et al. (Eds.), Kyiv, 2010. URL: https://chtyvo.org.ua/authors/Matiash_Iryna/Arkhivna_ukrainika_v_Kanadi_dovidnyk/. [in Ukrainian]
- [4] Archive of the Ukrainian Nationalist Organization. URL: <https://ounuis.info/>.
- [5] D. Dosyn, V. Lytvyn, V. Kovalevych, O. Oborska, R. Holoshchuk, Knowledge discovery as planning development in knowledgebase framework, in: Proceedings of the 13th International Conference on Modern Problems of Radio Engineering, Telecommunications and Computer Science (TCSET), Lviv, Ukraine, 2016, pp. 449-451, doi: 10.1109/TCSET.2016.7452085.
- [6] D. Mezzino, B. Moiso, T. Montonati, F. Lori, The Digitization of the Photographic Archive of Museo Egizio: Strategies of Interpretation and Communication, *Disegno* 10 (2022) 65-74. doi: 10.26375/disegno.10.2022.8.
- [7] Electronic library Chtyvo. URL: <https://chtyvo.org.ua/authors/>. [in Ukrainian]
- [8] Electronic library Diasporiana. URL: <https://diasporiana.org.ua/>. [in Ukrainian]
- [9] F. Liu, J. Hindmarch, M. Hess, A review of the cultural heritage linked open data ontologies and models, *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* 48 (2023) 943 – 950. doi: 10.5194/isprs-Archives-XLVIII-M-2-2023-943-2023.
- [10] H. Sojka-Masztalerz, M. Szala, Former archives of the University of Lviv as part of the digital GLAM, *Z Badan nad Ksiazka i Ksiegozbiorami Historycznymi* 16 (2022) 123-136. doi: 10.33077/uw.25448730.zbk.2022.718. [in Polish]
- [11] I. Matiash, Archival Ukrainian Studies in Canada: A Guide [Arkhivna ukrainika v Kanadi], Kyiv, 2010. [in Ukrainian]
- [12] I. Tiurmenko, L. Bozhuk, Yu. Smolnikov, Yu. Syerov, Digital communications of Ukraine archival institutions, *Studies in Systems, Decision and Control* 421 (2022) 449-470.
- [13] J. de Mooij, C. Kurtan, J. Baas, M. Dastani, A Computational Framework for Organizing and Querying Cultural Heritage Archives, *Journal on Computing and Cultural Heritage* 15 (2022). doi: 10.1145/3485843.
- [14] J. Potts, *Use and Reuse of the Digital Archive*, Palgrave Macmillan, Cham, 2021. doi: 10.1007/978-3-030-79523-8.
- [15] M. Paliienko, Ukrainian archival centers in North America [Ukrainski arkhivni oseredky v Pivnichnii Amerytsi], State Archive Service of Ukraine. URL: <http://surl.li/drviz> [in Ukrainian]
- [16] P. Peucker, The Role of the Archives in a Digital World, *Journal of Moravian History* 22 (2022) 157-162. doi: 10.5325/jmorahist.22.2.0157.

- [17] S. Parkhomenko, Hennadii Ivanushchenko: We must restore the memory of Ukrainians lost in history [Hennadii Ivanushchenko: Maiemo povernuty pamiat pro zahublenykh v istorii ukrainsiv] Historical truth, 2016. URL: https://www.istpravda.com.ua/digest/2016/12/24/149412/view_print/. [in Ukrainian]
- [18] T. K. Gireesh Kumar, R. Raman Nair, Conserving knowledge heritage: opportunities and challenges in conceptualizing cultural heritage information system (CHIS) in the Indian context, *Global Knowledge, Memory and Communication* 71 (2022) 564-583. doi: 10.1108/GKMC-02-2021-0020.
- [19] University of Manitoba, Prairie Immigration Experience Metadata. URL: https://digitalcollections.lib.umanitoba.ca/islandora/object/uofm%3Apie/manitoba_metadata
- [20] Yevhen Konovalts, Center of Ukrainian culture and education, 307/19. Part.1. Folders 1-18; Part 2. Folders 1-87. [in Ukrainian]