
CASE STUDY: CITIZEN SCIENCE IN DIGITAL HUMANITIES CONTEXT

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ABSTRACT

Modern academic librarians strive to qualitatively meet the information needs of their users. At the same time, librarians seek to take an active part in the organization and conduct of research. In this paper, we present the successful experience of Borys Grinchenko Kyiv University (Ukraine) in working on the wiki project "Dictionary of Borys Grinchenko" which uses elements of digital humanities, citizen science and gamification. The main aim of this project is to involve university students in getting acquainted with the Dictionary of the famous Ukrainian ethnographer and ethnographer Borys Grinchenko (1863-1910). During the project, students compete among themselves who will add the most quality explanations and visualizations of the Grinchenko's Dictionary words to the University wiki portal. The results show that this project not only promotes the development of university web resources but also promotes cultural heritage, develop successful team building, helps to the involvement of students in research activities. This experience will be useful for other academic libraries looking for ways to join the digital humanities and can be replicated in small, low-budget academic institutions.

Keywords Digital humanities, Citizen science, Citizen humanities, crowdsourcing, gamification

1 Introduction

The development of Digital Humanities (hereafter DH) at the present stage opens new opportunities for scientific libraries and poses new tasks and challenges. On the one hand, research libraries can become centers for conducting DH-research and implementing relevant digital projects. At the same time, despite the fact that DH dates back to the middle of the last century, this area of work is relatively new for academic librarians. Therefore, academic librarians are still working to better understand their role in this new academic system, to acquire relevant skills, tools and technical means. In this paper, we describe in detail a real example of the implementation of the DH-project, which can be implemented in many other university libraries, as it uses well-known practices in modern library work, such as crowdsourcing and gamification.

Today, many libraries are running large-scale projects related to the digitization of printed materials. Similarly, many research libraries actively support and promote the open institutional repositories of their institutions, and their users are interested in effectively presenting their research results in the public domain to support the ideas of open science. Academic librarians have been working for a long time to provide their users with relevant materials and tools for research, so it is logical that modern librarians are interested in continuing these processes in the framework of DH-projects.

2 Background

Today, the Humanities' science community is demonstrating its readiness to use the achievements of information science and new computer technologies to gain new opportunities for research. And this interest can be traced both among professional scientists and among students who are just beginning their research and want to be involved in the process of obtaining new scientific knowledge [1]. The opportunities offered by DH are increasingly attracting the attention of students that a humanities degree. Therefore, university librarians should integrate DH elements into their services and find ways to collaborate with faculty and students seeking to conduct research, create, and develop DH projects [2]; [3]. At the same time, such cooperation of librarians with researchers and students should be based on the principles of equal partnership. Academic librarians should not be given the role of outside observers, as they will be able to provide relevant information and technical resources for research, teach users how to use these resources effectively and help each group of stakeholders contribute to research and development of DH-projects [4]; [5].

3 Literature review

In the Humanities, there are already many research methods that allow you to gain new knowledge. However, the successful use of DH can expand the arsenal of these methods, and also can influence and partially transform the communication culture in the industry. The individual research remains widespread in the Humanities, and the researcher's subjective view is valued, while DH encourages the interdisciplinary collaboration - involving many researchers in the project through the use of digital tools, computational methods and open data [6]. Thus, the work of digital humanists contradicts the stereotypical notion of a lone scientist. The collaboration of researchers in the field of DH involves the use of common terminology, methods, theories, as well as the harmonization of work processes, values, goals and results of projects.

In this section, we will review the literature on DH, which focuses on the status and prospects of DH projects in academic libraries. The vast majority of DH projects described in the scientific literature are usually located in large research institutions in developed countries. However, areas of work related to the implementation of DH services and the implementation of relevant projects can also be used and put into practice in the work of small academic libraries in developing countries.

3.1 The role of libraries in digital humanities

As noted earlier, the mission of libraries is to meet the information needs of their users, it is important for modern academic librarians to understand the current issues of DH. Despite the prospect of using many new methods, practices and digital technologies [7], DH researchers face many barriers. These obstacles are primarily due to the fact that DH is still in the process of formation. While some researchers consider DH to be a well-established scientific discipline and appeal to numerous new specialized publications, obtained grant funding, implemented projects and vacancies [8], other scientists are much more cautious in their conclusions and point to the interdisciplinary nature of scientific projects and research in the field of DH.

Information technology itself is often a tool, an object of research, a research environment, so it is quite difficult to give an unambiguous definition of DH and today this term can be used in different meanings [9]. Also, new digital research methods are not always unambiguously positively perceived by scientists themselves. Not all scientists have felt the urgent need to integrate new digital tools into their research process [10], and therefore such scientists may be skeptical about the prospects for the development of DH as a separate scientific discipline.

However, regardless of how scientists perceive DH (as an established discipline, or simply as a set of convenient digital technologies), researchers agree that the work in DH is mainly related to such areas as: digitization, crowdsourcing, databases, digital curation, texts, editing, visualization, geospatial, gaming and code [8];[11]. Each of these key areas of DH has its own history of origin and development, but at the present stage, these areas are often combined to create new dynamic opportunities for the development of DH information resources and services in academic libraries.

Library science is very frequently mentioned in the context of DH and all researchers unanimously agree that academic libraries play a very important role in DH, regardless of the reasons for this connection [12]. Today, research libraries can successfully support research in DH, using existing developments to ensure the preservation, access and support of users of scientific and cultural collections, as well as providing physical and virtual spaces and tools for researchers, communities and volunteers. It is the development of active working collaboration with researchers that is a productive way to involve the library in the implementation of influential digital DH-projects. At the same time, libraries do not need to be radically transformed to perform the relevant tasks of the DH-project. It is enough for libraries to strategically focus their work on those areas of work in which they have already succeeded, and additionally offering

partner researchers access to their infrastructure. In addition, research shows that with its stable infrastructure, libraries can help maintain uninterrupted access to ongoing DH projects and research results even after the end of the project [13], which is in the interests of the scientific community and regional communities for whom these projects are valuable.

Identifying the needs of researchers is an important task for the head of the research library, who has decided to take care of DH. As a rule, each research library already provides users with resources and services that meet the needs of DH to some extent. Thus, scientific libraries can store and organize various special collections of books, periodicals and other materials on the Humanities, digitize these library collections to facilitate the work of users, as well as to analyze large volumes of text using computer algorithms. Also in many scientific libraries there is a position of subject librarians [14];[15], who help scientists at different stages of their research. Traditionally, academic librarians provide services for collecting scientific literature and open data for researchers. And these things are also necessary when implementing DH-projects in the library. Similarly, researchers may need access to specialized software or equipment, for example, to collect, analyze, visualize, and store scientific big data. The research library may share existing equipment, or use unused server space, organize training on the use of specific software or tools, or try to submit a joint grant project with researchers to obtain the necessary equipment.

Scientists working in a variety of scientific disciplines often depend on research services provided by government and commercial institutions. In this regard, various forms of inter-institutional scientific cooperation are very common today. Researchers that working in the Humanities have long-standing partnerships with academic libraries [16] and DH can give a new impetus to the development of library services and collaboration between librarians and humanities scholars. Many Ukrainian academic libraries also actively implement and offer new services for scientists [17], although most often of these services are universal and aimed at meeting the needs of scientists in different fields, not only for the Humanities.

The implementation of DH services in the work of scientific libraries requires, first of all, the availability of qualified staff with relevant skills. If earlier a significant part of research in the field of DH was related to text analysis [18], today researchers pay a lot of attention to non-textual materials, and this requires the use of various tools and relevant knowledge about their application. However, according to research, educational initiatives to train professionals to support DH projects have begun around the world relatively recently [19] and discussions are underway on a set of competencies for DH-professionals [20]. At the same time, DH offers a new, interesting approach that can be useful both for the development of humanities research and for the transformation of library services. Therefore, it is necessary to fully support these processes, in particular as part of research activities of the university.

3.2 Citizen science, citizen humanities and gamification

According to the generally accepted notion: scientists are by all means trained specialists who work in appropriate institutions and use special equipment. Accordingly, in order to become a scientist, you need to obtain the appropriate education, and people without special education cannot become direct participants in the process of acquiring new knowledge. However, the relationship between scientists and the public is now actively developing using new approaches, including crowdsourcing and crowdsolving. Also, a new vision of Open Science has been formed, which envisages a departure from the research culture, which focused its attention primarily on the final results. Instead, under the new Open Science approach, every step of research and data can be traced, verified, and reproduced.

Today, in many disciplines, scientists have managed to accumulate such large amounts of initial data that they are extremely difficult to analyze for a few scientists. At the same time, the development of computer technology has led to the fact that many users have tools with which they can conduct research without special education and technology. Thus, scientists began to use the practice of transferring some scientific activities to a large network of volunteers [21], and such scientific research that conducted entirely or partially by non-professional scientists is called "Citizen Science" (hereafter CS) [22]. This practice has its advantages. First, one can try to use the "wisdom of the crowd" and hope that a large group of people will do the job better than a limited number of professionals. Scientists can also use numerous volunteers to share routine tasks that cannot be automated. The combined strategies are often used, for example, in libraries when it is necessary to process large open electronic collections and improve the quality of metadata documents in these collections [23].

New trends and practices related to Open Science are actively developing in the Humanities, and CS in the humanities has even received a separate term - Citizen Humanities (hereafter CH) [24]. The use of practices that are now associated with CH has a long tradition in the Humanities. In contrast to the Natural sciences, where research results are usually disseminated in specialized journals among a narrow audience of specialists, the Humanities, on the other hand, address a wide audience through various channels of communication and the use of local languages. The development of digital technologies and DH-tools has simply opened up new ways to involve citizens in the Humanities, to study cultural

heritage, archives and libraries. Thus, CH can combine current public interests with scientific research, while gaining new knowledge, and at the same time explain to the public the need for the Humanities sciences for society.

The most common CH practices cover tasks related to the transcription of texts and the description of artifacts, which allows researchers to more quickly obtain the necessary information, as well as to identify new connections between the studied objects. Many components are required for the successful implementation of CS initiatives, but one of the main challenges is to attract numerous participants and motivate their active and long-term participation. In recent years, various CS projects have resorted to various gamification tools - attempts to make research tasks more like games, using a variety of game elements, including assessment and competition with other participants [21]. Presenting scientific information in research projects in this way makes the task more attractive in the eyes of the participants, promotes the involvement of activists, and encourages the public to long-term interaction and participation in research.

4 Case Study

Borys Grinchenko Kyiv University successfully implemented an original DH-project to include elements of Citizen Humanities and Gamification. Borys Grinchenko Kyiv University is located in Kyiv, Ukraine. The university consists of six institutes, four faculties and one university college with more than 9,000 students. Each year around 6000 teachers and school principals enhance their skills and gain qualifications at the university. The university is named after Borys Grinchenko (1863-1910) - in honor of the famous Ukrainian lexicographer, literary critic, ethnographer, historian, writer, teacher, publicist. Also, Borys Grinchenko is the author of the first dictionary of the Ukrainian language, which had a great influence on the establishment of the Ukrainian literary language and literary spelling.

At Borys Grinchenko Kyiv University, students and teachers of the university are involved in joint active scientific, educational and cultural activities, and various tools are used for such involvement. In particular, a university wiki portal has been created (wiki.kubg.edu.ua), which allows numerous users to quickly share knowledge. Compared to regular sites where content is provided primarily by the owner, the wiki portal offers content created by the users themselves. It has radically changed the common perception of how information is created, distributed and used [25].

The first collective project on the wiki portal of the Borys Grinchenko Kyiv University was the project "Dictionary of Borys Grinchenko" (started in 2011). The task of this wiki project is to involve students in getting acquainted with the unique dictionary of Borys Grinchenko [26]. Grinchenko's "Dictionary of the Ukrainian language" (approximately 68 thousand words) was first published in 1907-1909 in Kyiv, and it had a great influence on the establishment of the Ukrainian literary language and literary spelling, so the Dictionary has great historical and cultural value for Ukrainian linguists. In order to achieve this goal, all the words from the Dictionary were first posted in the form of articles on the wiki portal of the University. All Internet users were given the opportunity to supplement the interpretation and visualization of words from Grinchenko's dictionary on the wiki portal. As a result, they can add additional information links, images, audio and video to all words from the Grinchenko's dictionary. The basic wiki pages for this project were created by the IT in Education Laboratory of the Borys Grinchenko Kyiv University. Also, this university department was responsible for the technical support of this wiki portal.

For the purpose to draw public attention to the project and motivate users to actively editing and supplementing project pages, the University used elements of gamification, namely - launched the annual competition "Dictionary of Grinchenko and modernity" for the best explanation, interpretation and visualization of words from the Grinchenko's Dictionary. This competition is held in two stages. The first stage of the competition involves the placement on the University wiki portal of links, images, videos, texts that complement the explanation and visualize the words from the Dictionary. The participant selects the appropriate word and then additions materials in the selected wiki article, based on a specially created template. Each participant could choose any word for work. Also, the same wiki page could be edited by several contestants. Recommendations for word visualization - the presence of additional correct and relevant links to other materials, the presence of multimedia elements, relations with foreign sources.

At the first stage, every University student can take part in the competition. User affiliation information is automatically recorded on the wiki portal, along with other information about the author of the page edit. Each faculty and institute of the university receives points according to the number of words processed by students studying at this faculty or institute. Criteria for evaluating and scoring points for the processed words are presented in the Table 1. The participant of the competition for the description of one word from the dictionary could gain a maximum of 20 points. The quality of interpretations and visualizations of the words of Grinchenko's Dictionary was checked by the university professors, who agreed to help with this competition.

The second (final) stage of the competition takes place offline. A team of up to 5 people from each unit perform at the final stage of the competition. Team support groups are also invited, who can earn extra points for their team. Each team presents the 3 best interpreted words of their choice. Team presentations should combine creativity, theatricality,

Table 1: Criteria for evaluating the quality of explanation and visualization of words in the competition "Dictionary of Grinchenko and modernity"

Evaluation criteria	Explanation of evaluation criteria
Modern Ukrainian dictionaries	The meaning of the word was found in modern dictionaries of the Ukrainian language - 3 points
Foreign dictionaries	The meaning of the word was found in the non-Ukrainian dictionaries - 3 points
Image	The description of the word contains correct images - 1 point
Audio	The description of the word contains correct audio - 1 point
Video	The description of the word contains correct video - 1 point
Interesting Facts	The description contains interesting facts related to this word - 1 point
Additional links available	The description of the word contains correct references to other resources - 1 point
Word usage	If the word is rarely used, the number of points is multiplied by 2

musicality and brightly reveal the chosen words (Fig. 1). The performances of the teams are evaluated by a jury consisting of university staff, and the winner is determined on the basis of the total number of points received by the teams for all stages of the competition.



Figure 1: Students present interpreted words at the "Dictionary of Grinchenko and modernity" contest. Students present interpreted words at the "Dictionary of Grinchenko and modernity" contest. (<https://t.ly/9ePq>).

This competition is held at the Borys Grinchenko Kyiv University every year. Information about the competition and rules of participation are disseminated through online information resources of the university. There is also a curator at each faculty and institute who oversees this competition. The first stage of this competition lasts continuously throughout the year. The final takes place in December to sum up the results and determine the winners.

Since the creation of this project, the university's wiki portal has registered 8,920 users and made more than 350,000 page edits. Each year, contestants manage to add explanations and visualizations to about 1 thousand words. As of November 2021, users have processed more than 12,000 words of the Grinchenko Dictionary (17% of the total). Significant results of this project were not only the interpretation and visualization of words of the Dictionary, but also: promotion of cultural heritage, successful team building, active involvement of university students in scientific work that corresponds to DH approaches.

The use of gamification elements in the process of filling the wiki project pages "Dictionary of Borys Grinchenko" has become an influential factor in attracting users to this project. Using this experience of Grinchenko University in other institutions, it should be borne in mind that it is difficult to constantly attract the attention of potential participants to the competition throughout the year. This task requires the activity of the curators of the competition, as well as the timeliness and regularity of the relevant motivational posts for students on the university's website. Also, we consider the benefits of creating additional intermediate stages of the competition, creating a ranking of participants and determining the winners of the month.

5 Future work

This experience of using gamification in the wiki project has led to further intensification of crowdsourcing activities and the creation of other DH-projects in other departments of Grinchenko University, in particular in the university library. One of the promising new projects of the Borys Grinchenko Kyiv University Library is the creation of an electronic archive and text corpus of Borys Grinchenko. The purpose of this project is to popularize the scientifically verified work of Borys Grinchenko in the Ukrainian and world scientific community. The project envisages the creation of an open platform for the collection, preservation, organization and scientific processing of Borys Grinchenko's works, related documents, and photographic materials about him and his time.

This project will use electronic collection management systems and the introduction of technology of group scientific textual and academic processing of Grinchenko's works on the principles of crowdsourcing. The peculiarity of this project is not only to digitize and collect Grinchenko's works on a single web resource, but also to provide an opportunity to analyze this text corpus to various researchers (not only to professors and students of our university), with the involvement of the method of scientific crowdsourcing. We want to convert Borys Grinchenko's works to machine-readable format and allow researchers to analyze them using the library's software (which also needs to be developed), as well as using their own tools. We also plan that university professors from various scientific disciplines, including linguistics and computer science, will involve students in this research work to demonstrate how modern methods of computer analysis can be used to gain new knowledge from old texts.

Unfortunately, today many existing attempts to create digital archives of works by Ukrainian writers are limited to the presentation of the sources themselves without their scientific support and commentary. In addition, many machine-readable texts of classics of Ukrainian literature available today do not come from original works of writers, but from Soviet publications, which could have been subjected to significant editorial interference and ideological distortion by Soviet censorship [27].

Some important steps in digitizing and presenting the Borys Grinchenko works have already been made by the Grinchenko University Library in previous years, but the results of these projects do not comply with FAIR principles [28]. These digitized documents and their metadata are available online to anyone under open licenses. However, our library resources are primarily aimed at meeting the needs of human users, and do not take into account modern requirements for interoperability. Now we want to correct this lack of library digital collections and make Grinchenko's texts available for analysis for both humans and machines.

The project is planned to be implemented in several stages:

- preparatory stage for digitization of documents and processing of digital material;
- installation and adjustment of the digital collection management system, development of the digital collection structure;
- filling this system with digital content, recognizing texts and converting them into machine-readable format;
- development of a prototype of the module of textual processing of texts and there are presented in the text corpus;
- use standard NLP methodology to convert the texts into a dataset of tokens such as meaningful terms and phrases;
- modernization of the existing web resource grinchenko.kubg.edu.ua using the above module; experimental approbation and testing of the prototype of the module.

The implementation of this library project will also provide an opportunity to develop experience in creating similar digital collections, which can be used to create a text corpus by other authors. In the long run, we want to create a Borys Grinchenko Kyiv University Library Research Center to develop software and cyberinfrastructure to enable advanced computational access to digital scientific historical texts in Ukrainian.

6 Conclusion

In this paper, we presented an example of implementation of the DH project in a small academic institution. One of the main factors for the success of the project is a developed system of partnerships within the institution (between teachers, students and university researchers), and the maintenance of information resources of the institution at the appropriate level. Academic librarians, as a rule, already have established cooperation with teachers and students. Therefore, librarians should use this experience and this advantage in their research, and actively use advanced DH- and CS-technologies in their work with the involvement of elements of gamification.

Ukrainian academic libraries have accumulated a lot of scientific, educational and cultural digital materials that are suitable for research using modern technical tools. University libraries can be a common platform for students, graduate students and faculty to work on joint DH-projects, and together with librarians, they can all make a significant contribution to the development of the Humanities.

Today, the most academic libraries manage institutional repositories, combine all the institution's research resources into a single search interface, and seek to offer their users up-to-date services to best meet the information needs of researchers. DH-projects can be very effective forms of work with users, which will give a new impetus to the development of the library business at the present stage. The availability of smartphones, wireless networks, the willingness of the younger generation to openly cooperate on the Internet are important factors in the possible future success of such projects.

Also, in addition to gaining new knowledge, DH- and CS-technologies can reveal the cultural potential of library collections, change and enrich existing approaches to the preservation and promotion of cultural heritage.

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