



## **Open access to scientific resources of institutional repositories of Ukrainian higher educational institutions for information and library direction**

**Olena Karpenko\***

PhD in Pedagogical Sciences, Associate Professor  
Associate Professor of the Documentation Science and Information Technologies Department  
State University of Information and Communication Technologies  
03110, 7 Solomyanska Str., Kyiv, Ukraine  
<https://orcid.org/0000-0002-9922-165X>

**Nataliia Kobyzhcha**

PhD in Cultural Studies, Associate Professor  
of the Information Technologies Department Kyiv National University of Culture and Arts  
01601, 36 Yevhena Konovalsia Str., Kyiv, Ukraine  
<https://orcid.org/0000-0003-1683-3325>

**Abstract.** The purpose of the article is to analyse the level of providing open access to scientific resources in Ukrainian higher education institutions' institutional repositories for information and library direction. The research methodology is based on general scientific and special cognition methods, including analysis, synthesis, monitoring and comparison. The scientific novelty of the work consists of expanded ideas about the possibilities of activating the work of higher educational institutions' institutional repositories for information and library direction as a component of determining their ratings at the world level through the maximum realising open-access provision to their scientific resources for developing scientific and technical progress. Conclusions. The article analyses the institutional repositories of 10 higher education institutions for information and library direction by using Webometrics, QS World University Rankings, and SimilarWeb. The analysis of using the level of institutional repositories testified to its inadequacy. The research based on using web analytics by SimilarWeb made it possible to identify four leaders of higher education institutions in terms of the number of users' visits to their repositories: West Ukrainian National University (WUNU), National Aviation University (NAU), Ternopil National Technical University named after Ivan Puluj (TNTU). Geographical, gender, age, thematic diversification of higher educational institutions' institutional repositories, as well as the level of their using the main communication channels (direct appeal, regular search, referrals, e-mail, social networks) thanks to the analysis of their websites' traffic were determined. The recommendations for improving information culture for scientific and pedagogical staff, students, librarians, management of higher educational institutions for information and library direction, and all participants of scientific communication were given through activating their using institutional repositories to promote them in the global scientific and educational space as components in increasing the rating positions of higher educational institutions in Webometrics and QS World University Rankings thanks to providing open access to scientific resources for developing scientific and technological progress

**Keywords:** institutional repository; higher education institution; open access; scientific resources; training for information and library specialists; communication channels; information culture

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\*Corresponding author



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## Introduction

Globalisation of society is impossible without ensuring open access to its scientific assets for the development of scientific and technological progress. Programmes, projects, and other documents of many international organisations (EU, UNESCO, IFLA, and others) are aimed at ensuring access to global knowledge of society by providing open access to information relevant to consumers in the context of the world experience of disseminating research results of scientists (Open Access). It is the institutional repositories, as a component of the implementation of the concept of open science, that play an important role in ensuring consumer access to information in the global society. This actualises the problem of the current research through the study of the dynamics of providing access to scientific information of institutional repositories of higher education institutions of Ukraine, where specialists are trained in the speciality 029 "Information, library and archival studies", who are potential future employees of libraries, whose components are such repositories. The specified problem is relevant and timely in Ukraine in the crisis conditions of martial law, which caused the need for blended, and in some regions only online training, as well as in the context of the implementation of the relevant legislative documents (the Resolution of the Cabinet of Ministers of Ukraine "Regulations on the National Repository of Academic Texts of Ukraine", Concept of the State Targeted National Cultural Programme for the Creation of a Unified Information Library System "Library – XXI") (Approved by the Cabinet..., 2009).

The problem of studying the essence and institutional repository functionality in the context of open access to library information resources attracts the attention of many researchers. Today, there is no unified definition of the concept of "institutional repository", which is usually defined as:

- an electronic collection of processed and preserved intellectual products of an academic society, which ensures its distribution and provision access to it (Levchenko, 2018);
- an organised collection of digital documents and a set of services around it, which represents the results of scientific research in online access, and also ensures their long-term, reliable storage (Official website of Zenodo, 2022).

Some aspects of the problem of open access to scientific information through developing institutional repositories were studied by domestic and foreign scientists, in particular: O. Karpenko & N. Kobyzhcha (2023), N. Levchenko (2018), V.P. Oleksiuk & O.R. Oleksiuk (2012), Y.I. Palekha (2018), T. Yaroshenko (2011), R. Crow (2002), M. Mičunović *et al.* (2021) and others.

Ensuring open access to scientific knowledge and public assets is carried out following the principles of the Budapest Open Access Initiative, the Berlin Declaration on Open Access to Scientific and Humanitarian

Knowledge, the Bethesda Declaration on Open Access Publications, the Scottish Open Access Declaration and the Open Access Concept of the International Federation of Library Associations and Institutions (IFLA) (Karpenko & Kobyzhcha, 2023).

There are two ways to advance scientific knowledge in open access: green (open-access repositories) and golden (open-access journals). The green path involves placing the publication in institutional repositories in the state of the non-peer-reviewed and peer-reviewed preprint, published post-print, and its revised version after publication. Scientists' self-archiving of their works is an important component of institutional repositories. All this ensures free and prompt consumers' access to relevant scientific information in real time through the possibilities of open access to publications, data, peer review of scientific research, and software (Official website of Zenodo, 2022).

Modern scientific communication is impossible without developing institutional repositories as a treasure of scientific works, whose current number in the world is 3922 according to Official website of Eurosvita (2023).

The purpose of the article is to analyse the level of providing open access to institutional repositories' scientific resources of higher education institutions in Ukraine in the information and library direction.

## Materials and Methods

The research methodology is based on general scientific and special cognition methods, including analysis, synthesis, monitoring and comparison. At the same time, the study of the dynamics of changes in the institutional repositories' work takes into account the results of the study of institutional repositories conducted last year.

To analyse the dynamics of providing open access to scientific information at institutional repositories of higher education institutions (HEI) that train specialists in the speciality 029 "Information, library and archival studies", the following ones were selected: National University of Kyiv named after Taras Shevchenko (KNU), National Aviation University (NAU), Lviv Polytechnic National University (LNU LP), National University of Lviv named after Ivan Franko (LNU), West Ukrainian National University (WUNU), Dnipro National University named after Oles Honchar (DNU), Ternopil National Technical University named after Ivan Puluj (TNTU), National Aerospace University "Kharkiv Aviation Institute" (KhAI), Donetsk National University named after Vasyl Stus (DNU), and Ivano-Frankivsk National Technical University of Oil and Gas (IFNTUNG).

The selection of universities was determined by the results of the Official website of Eurosvita. Webometrics Ranking of World Universities (2024) taking into account the rating for information and library higher education institutions. The methodology for comparing

the mentioned higher education institutions also took into account the following:

- visibility indicators (the number of external networks linking to the university's web pages);
- openness (the number of files available on the university website in pdf, doc, docx, ppt, pptx formats, indexed by Google Scholar);
- excellence (the scientific publications of higher education institutions' authors in journals indexed in the SCOPUS database, which are included in the 10% of articles most cited in their scientific fields according to the Scimago Group version within 5 years (Karpenko & Kobyzhcha, 2023)).

## Results

Institutional repositories are an important component of increasing the rating of higher education institutions, as they provide an opportunity to spread the scientific works of university researchers in the global scientific and educational space by adding them to the repositories directly by the authors. Selected institutional repositories, except for the repository of DNU named after Oles Honchar, work on software (software) DSpace (developed by the Massachusetts Institute of Technolo-

gy), which allows integration of the electronic repository into international registries (ROAR, OpenDOAR, and others). The institutional repository of DNU named after Oles Honchar works as a realisation of the diploma project of the university's students.

The Webometrics ranking determines the ranking of HEIs in the world, on the continent and in the country, taking into account their open-access provision to repositories, research results, educational materials, and so on. It should be noted that out of ten higher education institutions that train specialists in the field of information, library and archival studies, three of them appear in the QS World University Rankings (2024), as shown in Table 1. Compared to 2023, LNU LP improved its rating (from 1001-1200 in 2023 to 951-1000 in 2024), while LNU worsened it (from 801-1000 to 1201-1400), and KNU did not fundamentally change it (651-700 in 2023, 681-700 – in 2024) (Karpenko & Kobyzhcha, 2023). Three higher education institutions were included in the analysis of higher education institutions in 2024 and 2023: Dnipro National University named after Oles Honchar, Ternopil National University named after Ivan Puluj, and Donetsk National University named after Vasyl Stus.

**Table 1.** Rating of higher education institutions for information and library direction according to the criteria of transparency, openness, and excellence

HEI	The institutional repository's Internet address	Webometrics (Ukraine/continent/world)	Visibility (Impact)	Openness	Excellence	QS World University Rankings
KNU	<a href="https://ir.library.knu.ua/home">https://ir.library.knu.ua/home</a>	3/558/1473	2889	1122	1611	681-690
NAU	<a href="https://er.nau.edu.ua/">https://er.nau.edu.ua/</a>	4/688/1859	1469	1670	3009	–
LNU LP	<a href="https://ena.lpnu.ua/home">https://ena.lpnu.ua/home</a>	9/942/2819	5164	6553	1471	951-1000
LNU	<a href="http://dspace.lnublibrary.lviv.ua/">http://dspace.lnublibrary.lviv.ua/</a>	10/983/2976	1370	8368	3083	1201-1400
WUNU	<a href="http://dspace.wunu.edu.ua/">http://dspace.wunu.edu.ua/</a>	12/1007/3048	3944	1602	4130	–
DNU nm Oles Honchar	<a href="https://repository.dnu.dp.ua/">https://repository.dnu.dp.ua/</a>	14/1043/3227	3654	2103	4393	–
TNTU	<a href="https://elartu.tntu.edu.ua/">https://elartu.tntu.edu.ua/</a>	21/1210/3948	6312	2334	4686	–
KhAI	<a href="https://dspace.library.khai.edu/xmlui/">https://dspace.library.khai.edu/xmlui/</a>	23/1221/4015	4874	8368	3244	–
DNU nm Vasyl Stus	<a href="https://r2.donnu.edu.ua/">https://r2.donnu.edu.ua/</a>	26/1265/4253	6986	2724	4946	–
IFNTUNG	<a href="http://elar.nung.edu.ua/">http://elar.nung.edu.ua/</a>	31/1291/4335	6071	8368	3921	–

**Source:** developed by the authors

At the same time, some higher education institutions in 2024 retained their positions in the national ranking, in particular LNU LP, WUNU and KhAI, some improved or worsened them such as NAU (from 5<sup>th</sup> to 4<sup>th</sup> place), IFNTUNG (from 33<sup>rd</sup> to 31<sup>st</sup> place), KNU (from 3<sup>rd</sup> to 2<sup>nd</sup> place), LNU (from 8<sup>th</sup> to 10<sup>th</sup> place).

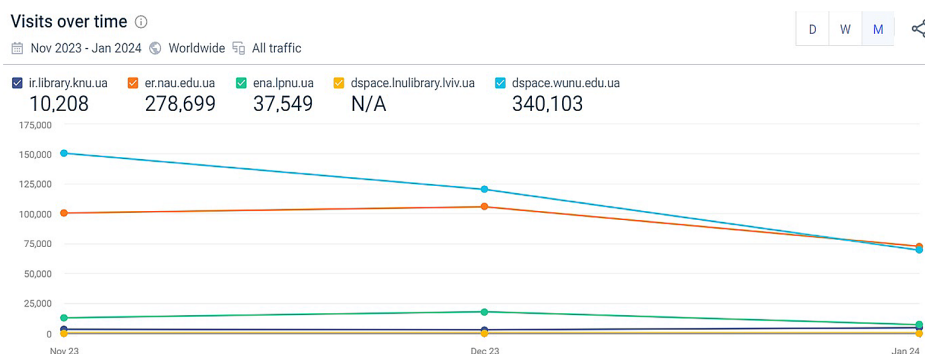
Comparing the dynamics of changes in the activity of higher education institutions by the visibility in terms of the number of external networks with links to the web pages of higher education institutions, we can state that DNU named after Vasyl Stus (6986), TNTU

(6312), IFNTUNG (6071) are leaders, and outsiders are: LNU (1370), NAU (1469), KNU (2889). The openness indicator regarding the number of documents on the website of the Higher Education Institution indexed in Google Scholar indicates the leadership of LNU, KhAI, IFNTUNG (8368) and the insufficiency of this factor in KNU (1122), WUNU (1602), NAU (1670). According to the index of excellence concerning the citation indices of higher education institutions' authors in the Scopus database, the leaders are Donetsk National University named after Vasyl Stus (4946), TNTU (4686), Dnipro

National University named after Oles Honchar (4393), and the outsiders are LNU LP (1471), KNU (1611), NAU (3009).

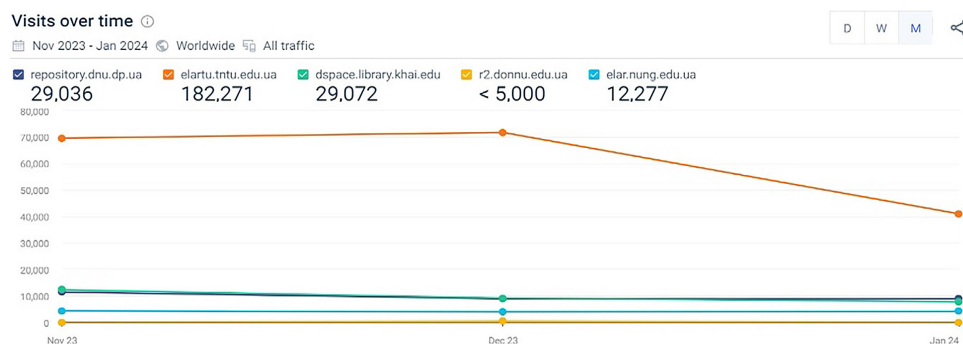
The analysis of the dynamics of providing open access to scientific information of institutional repositories was carried out using the analytical tool Similar-

Web.com according to the criteria of visiting repository websites; by geographic, gender, and age characteristics of their visiting; by channels that generate traffic to the websites of HEI repositories; by thematic consumers' requests. Figures 1 and 2 show the statistics of institutional repository visits within three months.



**Figure 1.** Statistics of repository visits of KNU, NAU, LNU LP, LNU, WUNU

Source: developed by the authors



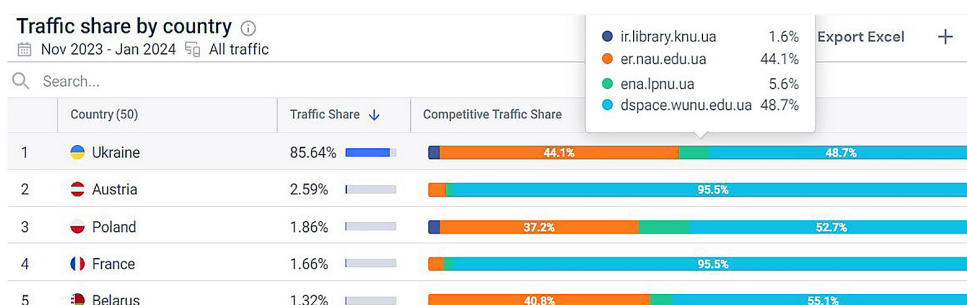
**Figure 2.** Statistics of repository visits of Oles Honchar DNU, TNTU, KhAI, Vasyl Stus DNU, IFNTUNG

Source: developed by the authors

According to the above analytics, it can be asserted that WUNU (340, 103) and NAU (278,699) remained the leaders in visits to institutional repository websites, as in 2023, followed by TNTU (182, 171) in 2024, while LNU (the number of visits was not indicated due to its insufficient) and KNU (10, 208) remained outsiders, as in 2023, and in 2024 DNU named after

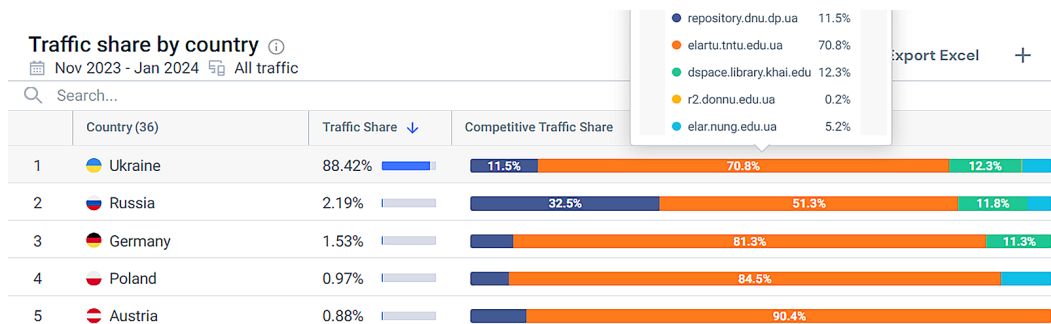
Vasyl Stus joined them too (less than 5000 visits). At the same time, it should be noted that compared to 2023, KNU has improved its results, given that it had less than 5000 visits in 2023.

The geography, gender, and age of the audience visiting the institutional repositories of higher education institutions were also analysed, as shown in Figures 3-8.



**Figure 3.** Statistics of repository visits of Oles Honchar DNU, TNTU, KhAI, Vasyl Stus DNU, IFNTUNG

Source: developed by the authors

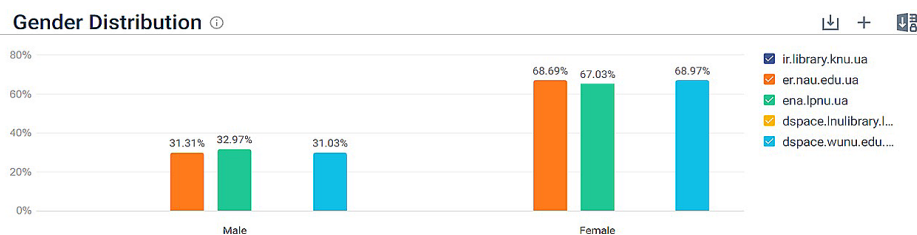
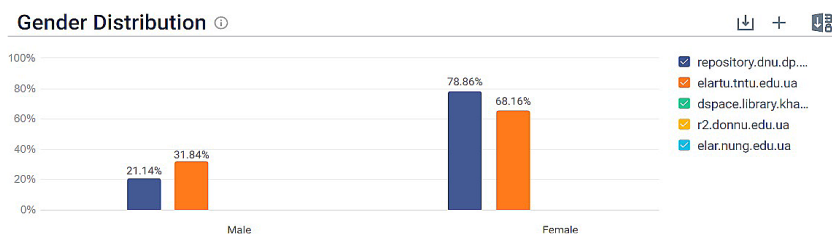
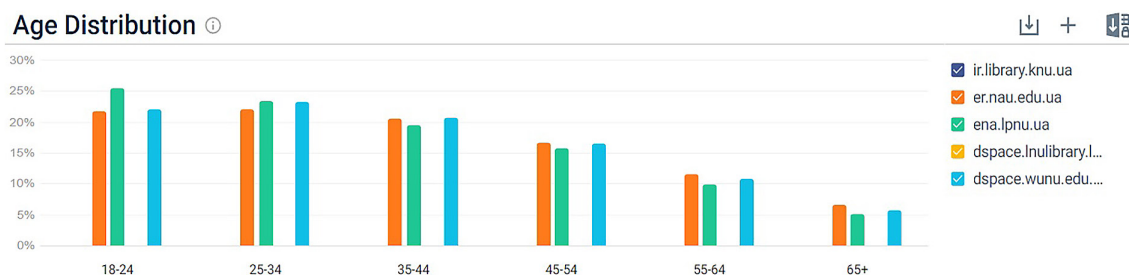
**Figure 4.** Statistics of repository visits of DNU named

after Oles Honchar, TNTU, KhAI, DNU named after Vasyl Stus, IFNTUNG by visit's geography

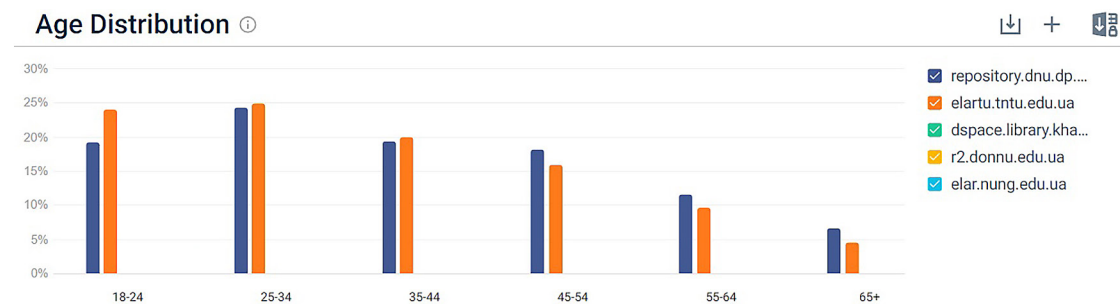
**Source:** developed by the authors

According to the above analysis, the websites of all higher education institutions' institutional repositories are used mainly in Ukraine. Due to insufficient use of the LNU website, the geography of its visit is not indicated, which makes it an outsider among the institutional repositories under investigation. In addition to visitors from Ukraine, institutional repositories

of WUNU and NAU are visited by users from Austria, France, Poland and Belarus, KNU – from Poland, DNU named after Oles Honchar and TNTU – from Russia, Germany, Poland, Austria, KhAI – from Russia, Germany, IFNTUNG – from Russia and Poland. Figures 5-8 demonstrate gender and age priorities in institutional repository visits.

**Figure 5.** Statistics of repository visits of KNU, NAU, LNU LP, LNU, WUNU by gender characteristic**Source:** developed by the authors**Figure 6.** Statistics of repository visits of Oles Honchar DNU, TNTU, KhAI, Vasyl Stus DNU, IFNTUNG by gender characteristic**Source:** developed by the authors**Figure 7.** Statistics of repository visits of KNU, NAU, LNU LP, LNU, and WUNU by age characteristic**Source:** developed by the authors





**Figure 8.** Statistics of repository visits of DNU named after Oles Honchar, TNTU, KhAI, DNU named after Vasyl Stus, IFNTUNG by age characteristic

Source: developed by the authors

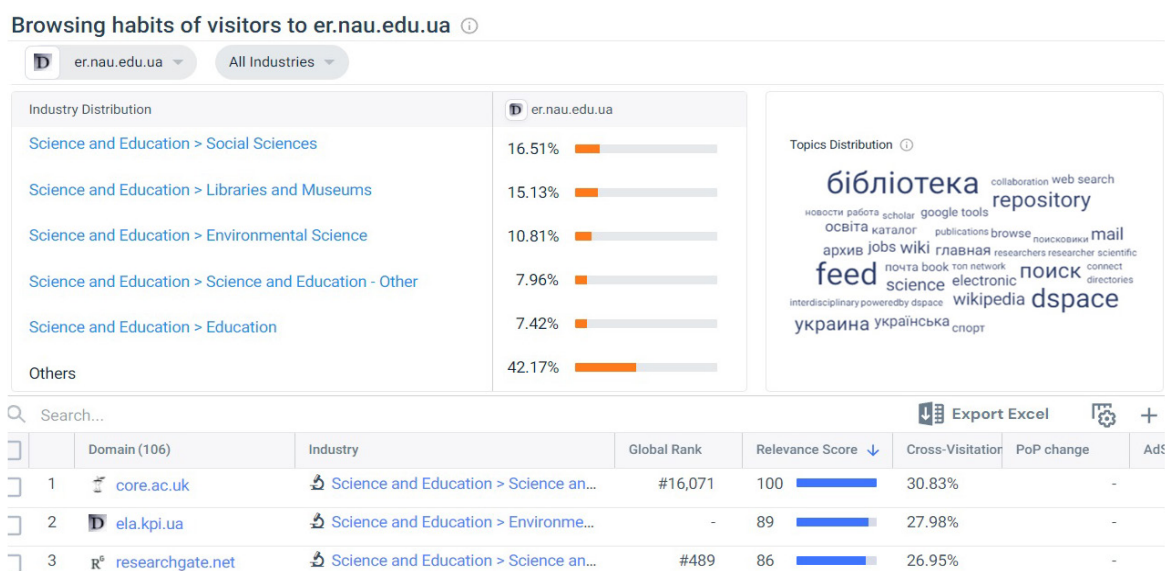
As can be seen from Figures 5-8, the leaders in visiting institutional repositories are female representatives of five out of ten higher education institutions: NAU, LNU LP, WUNU, DNU named after Oles Honchar, TNTU aged 18 to 65+. At the same time, young people

aged 18 to 34 prevail, and the smallest group of representatives is 65+. The thematic requests of visitors to the websites of institutional repositories of higher educational institutions were also analysed, which is presented in Figures 9-16.



**Figure 9.** Thematic user requests of the KNU institutional repository

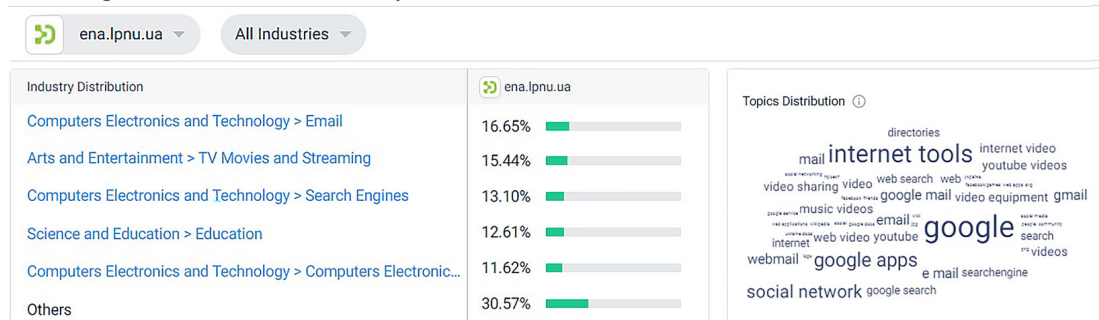
Source: developed by the authors



**Figure 10.** Thematic user requests of the NAU institutional repository

Source: developed by the authors

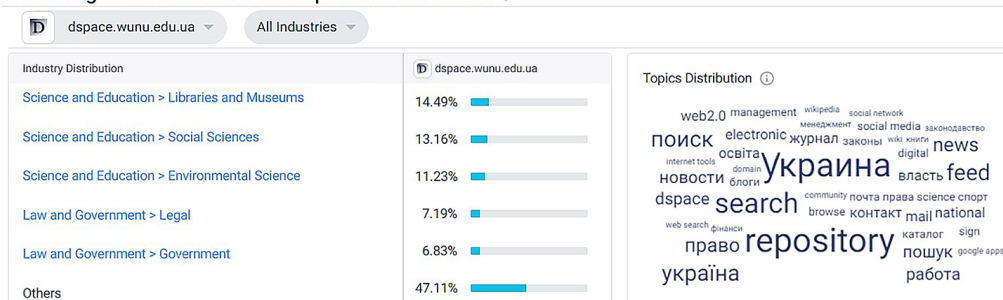
### Browsing habits of visitors to ena.lpnu.ua



**Figure 11.** Thematic user requests of the institutional repository of LNU LP

Source: developed by the authors

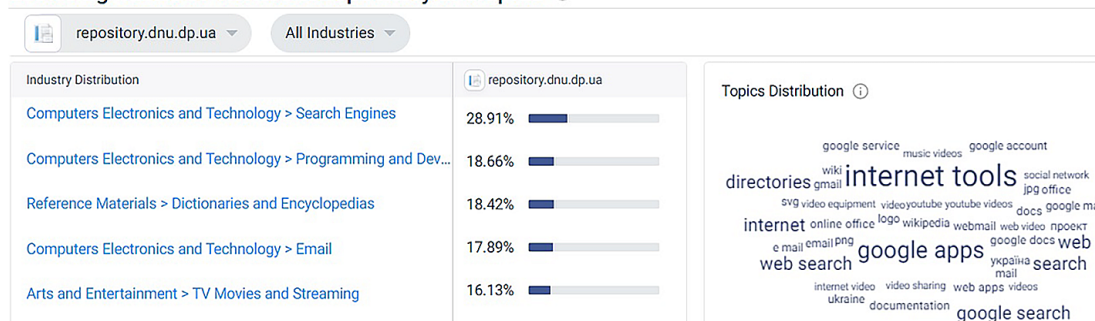
### Browsing habits of visitors to dspace.wunu.edu.ua



**Figure 12.** Thematic user requests of the WUNU institutional repository

Source: developed by the authors

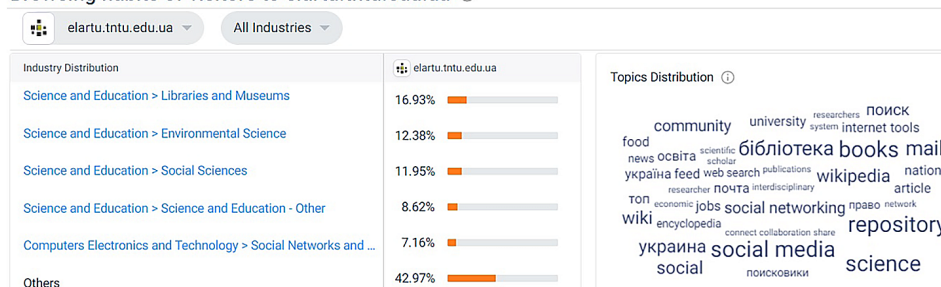
### Browsing habits of visitors to repository.dnu.dp.ua



**Figure 13.** Thematic user requests of the institutional repository of DNU named after Oles Honchar

Source: developed by the authors

### Browsing habits of visitors to elartu.tntu.edu.ua



**Figure 14.** Thematic user requests of the TNTU institutional repository

Source: developed by the authors

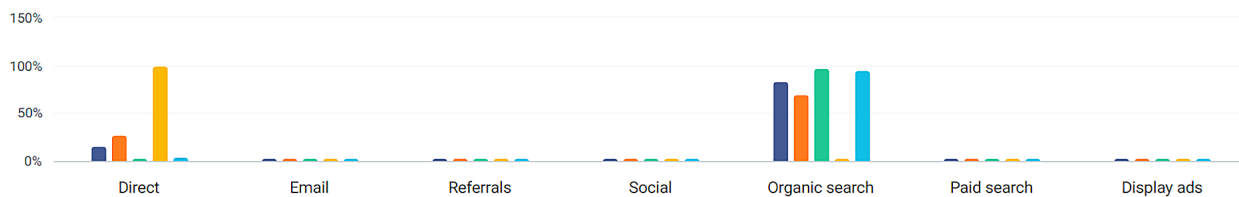




## Channels overview ⓘ

Nov 2023 - Jan 2024 Worldwide All traffic

repository.dnu.dp.ua 26,569  
 elartu.tntu.edu.ua 175,702  
 dspacelibrary.khai.edu 29,072  
 r2.donnu.edu.ua < 5,000  
 elar.nung.edu.ua 12,060



**Figure 18.** Channels that generate traffic to the websites of DNU named after Oles Honchar, TNTU, KAI, DNU named after Vasyl Stus, and IFNTUNG repositories

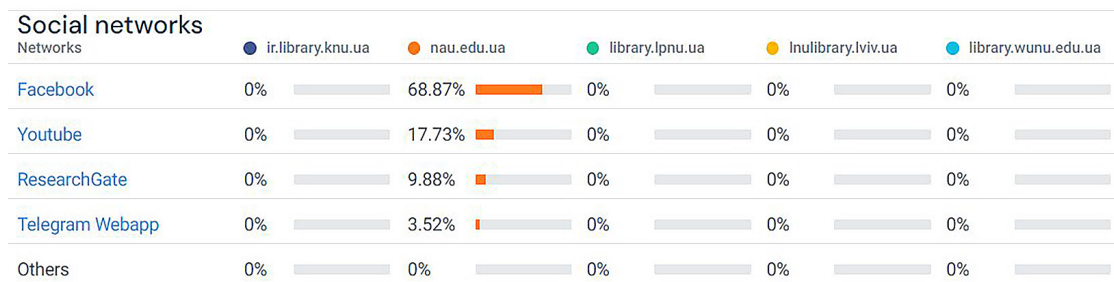
Source: developed by the authors

The analysis of the statistics of traffic channels to the websites of institutional repositories of higher education institutions proved that the main channels for their use are the following:

- direct: DNU named after Vasyl Stus (100%), LNU LP (38.03%), TNTU (27.95%), NAU (26.72%), DNU named after Oles Honchar (16.15%), LNU (15.82%), KNU (13.21%), WUNU (12.20%), IFNTUNG (4.47%), KhAI (1.9%);
- normal search (original search): KhAI (97.30%), IFNTUNG (95.53%), WUNU (87.77%), KNU (86.79%),

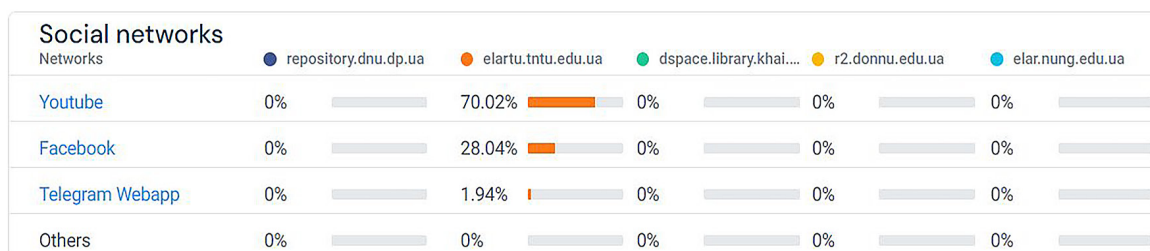
DNU named after Oles Honchar (83.81%), LNU (78.70%), TNTU (69.95%), NAU (68.95%), and LNU LP (61.97%);

- referrals: LNU (5.47%), NAU (0.74%), TNTU (0.67%), WUNU (0.03%), DNU named after Oles Honchar (0.03%);
- e-mail (email) – NAU (2.89%), KhAI (0.8%);
- social networks (social): TNTU (1.42%), NAU (0.69%). At the same time, the priorities of social networks are shown in Figures 19-20.



**Figure 19.** Social networks that contain links to the institutional repository websites of KNU, NAU, LNU LP, LNU, WUNU

Source: developed by the authors



**Figure 20.** Social networks that contain links to the institutional repository websites of DNU named after Olea Honchar, TNTU, KAI, DNU named after Vasyl Stus, IFNTUNG

Source: developed by the authors

According to the data in Figures 19-20, it can be stated that links to institutional repositories are actively used in the social networks of NAU (Facebook, YouTube,

ResearchGate, Telegram) and TNTU (Facebook, YouTube, Telegram). Due to insufficient use of social networks, information about other universities is not indicated.

The scientific novelty of the article lies in expanding the understanding of the possibilities of activating the institutional repository work of higher educational institutions of the information and library direction as a component of determining their ratings at the world level through the maximum implementation of their provision of open access to scientific resources for the development of scientific and technical progress.

## Conclusions

The conducted analysis of the level of open access to scientific resources of institutional repositories of information and library higher education institutions allows us to state that the “green way” of access is not sufficiently developed, even in those higher education institutions (KNU, LNU LP, LNU) that are included in the QS World University Rankings. At the same time, the institutional repositories of WUNU, NAU, and TNTU are the leaders in terms of visits by their users, while KNU, DNU named after Vasyl Stus and LNU are outsiders, despite a slight improvement in visits by KNU users compared to the previous year. The results of the analysis of traffic to the institutional repository websites of higher educational institutions by geographical, gender, and age characteristics indicate that they are used mainly in Ukraine, as well as in Austria, France, Poland, Belarus, Russia, and Germany. Due to the insufficient use of the institutional repository website of LNU, it is an outsider of the study according to the specified parameters. The majority of visitors to institutional repositories are women aged 18 to 34, the smallest – women aged 65+. In the absence of sufficient data, KNU, LNU, KhAI, DNU named after Vasyl Stus, and IFNTUNG are outsiders according to this criterion.

The obtained analytical data regarding the thematic user requests of the institutional repository websites of higher educational institutions are characterised by their diversification in the fields of computer technologies, science and education, art, jurisprudence among others. At the same time, there is a limitation in the user requests of KNU and IFNTUNG only to information in the field of computer technologies, and there is no information about the thematic focus of user requests of institutional repositories at LNU and DNU named after Vasyl Stus.

The results of the study of the use of communication channels proved that the most influential of them is direct access to the repository website as an indicator of its recognition and loyalty of the audience, in which DNU named after Vasyl Stus is the leader, while KhAI is the outsider, despite the fact that last year this university was ahead of the others in the use of this communication channel. Conventional search as a communication channel is popular among all researched institutional repositories of HEIs. LNU has remained

the leader in the use of referrals, the same as it was last year. The channel of transitions from e-mail is used only by NAU and KhAI, and the channel of social networks for the promotion of institutional repositories is used by TNTU and NAU, although these channels are used at a low level. However, it is the channel of social networks that should be given more attention, since it is an effective marketing tool for popularising information about the object of promotion.

Thus, to increase the effectiveness of providing open access to scientific resources at institutional repositories, it is possible to recommend to higher educational institutions' staff for information and library direction to improve their information culture regarding the active use of institutional repositories through the following steps:

- to the management of higher educational institutions to develop an action plan for the promotion of institutional repositories through organisational, PR and advertising activities with the involvement of mass media;
- to organise professional development, conducting training with academic staff on filling repositories with their research papers and updating the curricula for the training of future specialists to increase the effectiveness of scientific communication and the ranking of higher education institutions;
- to open up the opportunity for students to make proposals for the inclusion of relevant topics and/or disciplines in the curricula, which will contribute to the success of their careers as future specialists in providing open access to scientific resources;
- to provide an opportunity for the library employees of educational institutions, through the use of all communication channels, including the channel of social networks, to attract users through social networks activity and a strategy of interaction with them based on SMM-promotion. (The advantages of using this channel are not only additional traffic to the website, but also increasing the loyalty and recognition of institutional repositories, setting up effective advertising and the opportunity to receive feedback from users).

The implementation of the proposed recommendations for improving the information culture of the participants in the scientific communication of information and library-based higher education institutions will contribute to ensuring open access to scientific resources not only through the “golden path”, but also through the “green pass”, by intensifying work on filling institutional repositories and promoting them in the global scientific and educational space, which in turn will increase access to scientific publications of higher education institutions, their citation level, and the ranking of the university for the prosperity of scientific and technical progress.

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