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BIBLIOMETRIC ANALYSIS OF PUBLICATIONS OF SCIENTISTS IN OPEN ACCESS JOURNALS AS A TOOL TO INCREASE THE PUBLISHING ACTIVITY OF THE UNIVERSITY

Objective. The study is aimed at increasing the publishing activity and better presentation of scientific results of Admiral Makarov National University of Shipbuilding by expanding scientific publications in open access logs. Chronological frameworks of the studied scientific articles – 2017–2021. **Methods.** In order to obtain relevant empirical data, the authors of the research analyzed publications of the Admiral Makarov National University of Shipbuilding scientists in open access logs using products and services of scientometric database Scopus. The algorithm of "step-by-step" actions in the Scopus database was considered in relation to: the determination of the most relevant topics; formation of the circles for the most cited publications; determining the representation level of publications made by the University scientists in the Scopus database on the topic of the study. **Results.** During the study, the authors showed that complete and objective evaluation in the effectiveness of scientific activity of the institution is possible only with the analysis of open resources of scientific information; the percentage of publications in the open access of Admiral Makarov National University of Shipbuilding authors-scientists is growing: in five years, the number of scientific articles of open access has increased twice; the most popular publication model is GoldAPC; there are the most cited publications in foreign editions that relate to the first and second quartile. **Conclusions.** The authors firstly conducted a bibliometric study of scientists' publications in open access journals as a tool for raising the publishing activity of the university on the basis of products and services of the Scopus scientometric database. The research materials can be used to further increase of publishing activity both for individual scientists and institutions as a whole.

Keywords: Admiral Makarov National University of Shipbuilding; scientific library; open access; publishing activity; scientometric indicators; scientometric analysis; bibliometric research; Scopus

Introduction

Bibliometric studies of scientific activity allow you to identify ways of scientific growth and promising directions, to determine the place and potential of scientific collectives, to conduct information search for non-standard and non-traditional methods of science development and innovation. The article analyzes the publication of Admiral Makarov National University of Shipbuilding (NUS) scientists in Open Access (OA) logs using Scopus scientometric database products and services. Proposals are formulated to increase publishing activity and OA journals and better presentation of scientific results of the institution of higher education (IHE) by expanding publications in OA journals.

The idea of Open Access is relevant and worried by scientists and researchers around the world today, as never. It provides a unique opportunity to use most current and important information in their studies.

Open access to scientific publications as it is defined in the Berlin Declaration (Max-Planck-Gesellschaft, 2003), improves the pace and effectiveness of research, as well as increases the authors' reputation, and therefore, the potential impact of their work. This eliminates structural and geographical barriers that impede free circulation of knowledge that contributes to enhancing cooperation, finally strengthening scientific quality and capacity.

The transition to the system of OA opens new features of access to information and improves the transfer of knowledge to society, politics and economics. This is crucial to increase both the impact of publications and the economic efficiency of the publication system. OA promotes innovations and interdisciplinary research, scientific exchange on a global scale for the benefit of not only a research community, but also the economy and society as a whole.

Plan S, which was announced on September, 2018 cOAlition S, by an international consortium of granters from 12 European countries and the Ministry of European Researchers (ERC), joined on January, 31. This initiative is aimed at consolidating efforts on the transition to such publishing models that provide full, immediate OA to the results of scientific research as soon as possible. The main objective of cOAlition S is that the results of scientific researches, that were funded or are funded at the expense of state grants, should be published in the relevant OA logs or on the relevant open access platforms, which will also be determined by cOAlition S (European Science Foundation, 2021).

Plan S has already led to a change in the OA landscape, despite the complexity that it brings. Publishing houses, separate journals that have not previously supported the OP movement, are increasingly published reviewed articles in OA. There is an explosion of experiments with business models of OA. Plan S can also help change the modern scientific management culture with the help of metrics. All of this is a harbinger of open science formation (Else, 2021).

Free access to scientific information is a guarantee of academic freedom supported by university communities from all around the world. Today there are studies proving that scientific articles presented in OA are cited much more often than articles from traditional journals, and the rating of citation grows at least twice thanks to self-archiving, which makes research much influential.

Bibliometric analysis of publications of NUS scientists in OA logs was carried out using a Scopus database as a source base in the expert evaluation of scientific activity performance.

For many years, Elsevier Company is a supplier of high-quality and professional products for the world research space. The team develops instruments that are aimed at providing actual information that can be used in scientific research, and in recent times it makes steps towards the practice of open scientific information. Elsevier realizes the possibility of fast and free access to world research on its platform. Scientists can study reviewed works with more than 4000 editions, creating a powerful system in the field of communication.

The developers of the Scopus scientometric platform created the "Open Access" indicator, which helps easily to detect OA logs. At the end of 2020, new filters were added to help more clearly understand the type of OA for the scientific publication. This increased the existing number of publications of OA in Scopus for more than 5,5 million. Today, the total number of scientific documents of OA is more than 17 million. You can filter works by selecting the type of OA of each document in the left column according to the following indicators: "All Open Access" (all documents in the OA of any type); "Gold" (published versions of documents with the Creative Commons license are available on the publisher platform. Documents are published in journals publishing only documents in OA); "Hybrid Gold" (published versions of documents with the Creative Commons license are available on the publisher platform. Documents are published in journals that provide authors to select OA); "Bronze" (published versions accepted to print records or manuscripts. The publisher decided to provide temporary or constant free access to them. Bronze status is assigned to documents published under the license of a particular publisher, distinct from the Creative Commons license (for example, under the license of the Elsevier publisher for the Open Archive initiative), or the license is absent in general); "Green" (published versions of records or manuscripts adopted for printing and are

available in the repository. Documents may also be available with the "Gold" status or in another free form on the publisher platform).

The source of documents that are in OA for Scopus is an Unpaywall database, which is guided by an Impactstory non-profit organization. This database collected open materials from more than 50,000 places of publication and repositories.

The document in Scopus can be provided by more than one OA status, since the article may be available in different types of OA (for example, "Gold" and "Green"). There is a counter of "Gold" and "Green" status of the same document. The count of duplicates is not conducted for OA documents installed by the publisher, ("Gold", "Hybrid Gold" and "Bronze" categories).

Methods

The practical part of the study is carried out using analytical instruments of the Scopus science platform including annotations and information on the citation of reviewed scientific literature, with integrated bibliometric instruments for tracking, analysis, and data visualization.

The search work in Scopus database starts with the main page at <https://www.scopus.com>. On the starting page, we go to the tab "Affiliations" and enter the name of the institution in the search timing "Admiral Makarov National University of Shipbuilding". As a result of the search, the system finds the profile of the organization Admiral Makarov National University of Shipbuilding. The specifying search selected the "Documents, affiliation only" tab. In the NUS profile in the Scopus database were indexed 574 documents on September 20, 2021. Then, we analyze selected documents using the "Open Access" tab: All Open Access – 162; Gold – 118; Hybrid Gold – 4; Bronze – 30; Green – 59. From 162 documents in All Open Access, there are 152 articles (Article), 10 conference materials (Conference Paper).

We will analyze the number of OA documents of NUS authors-scientists for five years (2017-2021). As a result of the analysis, we obtain the number of published documents for each year (Table 1).

Table 1

The number of OA documents for NUS scientists in 2017-2021

Year	Documents in the NUS profile in the Scopus DB by years, among them:					
	Total	Open Access				
		All Open Access	Gold	Hybrid gold	Bronze	Green
2021	74	32 (43%)	21 (28%)	3 (4%)	8 (11%)	5 (7%)
2020	98	45 (46%)	37 (38%)	1 (1%)	5 (5%)	14 (13%)
2019	73	28 (38%)	23 (32%)	-	5 (9%)	14 (19%)
2018	59	27 (46%)	17 (29%)	-	7 (12%)	12 (20%)
2017	58	20 (35%)	15 (26%)	-	3 (5%)	8 (14%)
Total documents in the profile for 2017-2021, among them:	362	152 (41%)	113 (31%)	4 (1%)	28 (8%)	53 (14%)

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Total documents in the profile, among them:	574	162 (28%)	118 (21%)	4 (0,7%)	30 (5,2%)	59 (10%)
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Table 1 data demonstrate that the percentage of publications of NUS authors-scientists in the OA is growing rapidly. Among 162 OA documents presented in the institution's profile in the Scopus database, 152, which are 94%, have been indexed over the past five years. These 152 documents make up 41% of the total indexed publications for 2017-2021.

The GoldAPC model is the most popular (26% in 2017 and 38% in 2020) of all publications published by NUS authors-scientists, in which the authors pay for the publication of articles to provide immediate OA after publication.

Top five university scientists who have published the most OA documents for a specified period: Doctor of Economics, Professor Irtyshcheva I. O. (12 documents, including Gold – 10, Bronze – 2, Green – 1), Doctor of Technical Sciences, Professor Blintsov V. S. (10 documents, including Gold – 10, Green – 10), Doctor of Economics, NUS Professor Boyko E. O. (10 documents, of which Gold – 9, Bronze – 1, Green – 1), Doctor of Technical Sciences, Professor Serbin S. I. (8 documents, of which Gold – 6, Hybrid Gold – 1, Bronze – 1, Green – 1), Doctor of Technical Sciences, NUS Professor Trohymenko G. G. (7 documents, of which GOLD – 6, Bronze – 1, Green – 2).

One of the key skills in the 21st century is collaboration. Therefore, in order to provide a content interinstitutional collaboration when creating open resources, the NUS authors most often cooperate with scholars of such scientific institutions and higher educational institutions of Ukraine: National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (10), Odessa National Polytechnic University (9), Petro Mohyla Black Sea National University (8), SI "Institute of Regional Research named after M. I. Dolishniy of the NAS of Ukraine" (7), National Academy of Sciences in Ukraine (7), Mykolayiv National Agrarian University (7), Taras Shevchenko National University of Kyiv (6), Mukachevo State University (6), V. O. Sukhomlynskyi National University of Mykolaiv (6), Yuriy Fedkovych Chernivtsi National University (5), Mykolaiv Interregional Institute of Human Development of the University "Ukraine" (4), Politechnika National University – Odessa Maritime Academy (4), Ivan Franko National University of Lviv (4), Lviv Polytechnic National University (4) and others.

International cooperation is one of the ethical principles in higher education when all the participants in the educational process recognize the importance of international collaboration in education (Stadnyi, 2017). Therefore, developing cooperation with foreign partners for creating open resources, the NUS authors most often cooperate with scientists of such institutions as Gdańsk University of Technology (9), Politechnika Koszalin (4), LLC Motor-Plus (1), Politechnika Rzeszowska (1), Universität des Saarlandes (1), Tafila Technical University (1), Vilniaus Universitetas (1), Jiangsu University of Science and Technology (1), International Motor Bureau (1) and other from Poland, China, Iran, Latvia, Germany, India, Indonesia and other countries. This is confirmed by the language of publications. Publications of NUS authors in OA are published in three languages over the past 5 years. At the same time, more than 95% (148) are publications in English and 2.6% (4) in Ukrainian. The creation of large collaborations is also associated with the problem of the article's publications charge, which is a payment for articles processing (Article Processing Charge, APC), when the publisher charges payment from the authors for publishing their works in OA journals. The level of payment for publication can vary widely depending on the particular edition, so, in publishing houses that published the largest number of NUS authors' documents, the price varies in the range of \$ 300–1,000.

Over 2017-2021, the largest increase in the number of publications of NUS authors was affirmed in branches (Table 2): Business, Management and Accounting (76%), Energy (73%), Environmental Science (70%), Mathematics (55%), Social Sciences (49%), Engineering (43%), Computer Science (54), Earth and Planetary Sciences (43%), etc.

Table 2

The number of publications of NUS authors by the branches of learning

Branches of learning	Publications of NUS authors over 2017–2021	
	Total	OA (%)
Engineering	207	89 (43%)
Computer Science	149	55 (37%)
Mathematics	100	55 (55%)
Energy	86	62 (73%)
Business, Management and Accounting	84	64 (76%)
Physics and Astronomy	44	17 (39%)
Social Sciences	43	21 (49%)
Economics, Econometrics and Finance	33	10 (30%)
Decision Sciences	26	9 (35%)
Chemical Engineering	24	5 (21%)
Environmental Science	23	16 (70%)
Earth and Planetary Sciences	23	10 (43%)

We will analyze the source of documents. According to the Scopus database, the total number of editions in which documents of NUS authors were published is 67, for the period 2017–2021 there are 56 of such editions.

Table 3 presents editions-leaders, where the largest number of the university scientists OA documents was published with the definition of the publication quartile. Unfortunately, but among the publications, where our authors are most published, only two relate to the second quartile. They are Polish Maritime Research (Poland) and Eureka Physics and Engineering (Estonia). Among Ukrainian editions-leaders, the third quartile is the highest one.

Table 3

Edition-leaders, where the largest number of NUS scientists' documents was published

No	Publication Name	The number of documents	Publication Q	Jurisdiction of publication registration, publisher
1.	Eastern-European Journal of Enterprise Technologies	45	3	Ukraine, PC Technology Center
2.	Polish Maritime Research	8	2	Poland, Walterde Gruyter
3.	Technical Electrodynamics	7	3	Ukraine, National Academy of Sciences of Ukraine

4.	Estudios De Economia Aplicada	5	4	Spain, Asociacion Internacional de Economia Aplicada
5.	Eureka Physics And Engineering	5	2–3	Estonia, Scientific Route

The indicator of cited works usually defines a leader of publications international recognition. The next step of the study is to determine the most cited articles that make up the so-called "core" of the citation report (Table 4). To do this, we proceed to the "Viewing the Citation" tab and sort selected documents by the number of citations in descending order. The dynamics of citations for 2017-2021 are presented in Figure 1.

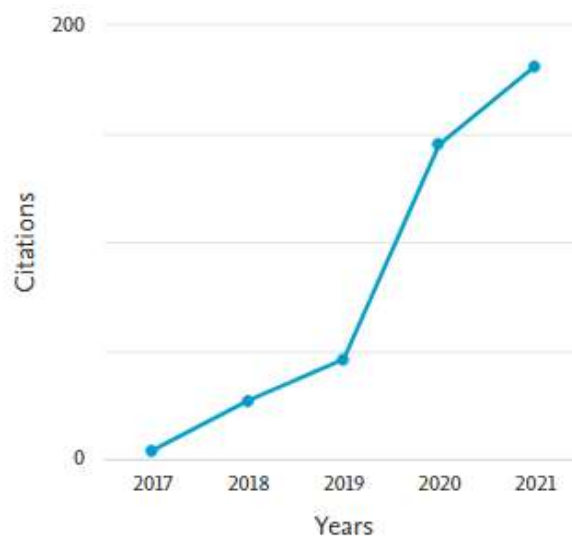


Fig. 1. Dynamics of citations for 2017-2021 according to the Scopus database

As it can be seen from Figure 1, the publication's citation during the period of 2019-2021 has significantly increased. The total number of citations selected for analysis of 153 publications is 439, 88 (58%) of them have a non-zero citation, 57 (37%) of documents have a number of citations of more than one, and three (1.3%) have the number of citations more than 20. The publication received more citations in 2021 (193), 2020 (149), 2019 (46).

TOP-5 of the most cited publications are presented in Table 4.

Table 4

Most cited publications of OA for NUS scientists according to Scopus database

Seq No.	Authors	The title of article	Publication name, publication Q	Year of publication	Total citations	The average number of citations per year
1.	Radchenko A., Radchenko M., Konovalov A., Zubarev A.	Increasing electrical power output and fuel efficiency of gas engines in integrated energy system by absorption chiller scavenge air cooling on the base of monitoring data treatment	E3S Web of Conferences -	2018	22	5
2.	Filipishyna L., Bessonova S., Venckeviciute G.	Integral assessment of developmental stability: Cases of Lithuania and Ukraine	Entrepreneurship and Sustainability Issues Q-1	2018	20	5
3.	Chernov S., Titov S., Chernova L., Gogunskii V., Chernova L., Kolesnikova K.	Algorithm for the simplification of solution to discrete optimization problems	Eastern-European Journal of Enterprise Technologies Q-3	2018	20	5
4.	Radchenko R., Radchenko A., Serbin S., Kantor S., Portnoi B.	Gas turbine unite inlet air cooling by using an excessive refrigeration capacity of absorption-ejector chiller in booster air cooler	E3S Web of Conferences -	2018	19	5
5.	Vasylytsiv T., Irtysheva I., Lupak R., Popadynets N., Shyshkova Y., Boiko Y., Ishchenko O.	Economy's innovative technological competitiveness: Decomposition, methodic of analysis and priorities of public policy	Management Science Letters Q-2	2020	18	9

In the five most cited articles, two ones published in the "E3S Web of Conferences" (France) are a series of open access publications devoted to the archive of conferences in all

areas related to the environment, energy, and land sciences. According to Scimago Journal & Country Rank, the quartile for this publication is not calculated (by CiteScore – Q4). Two journals (Entrepreneurship and Sustainability Issues (Lithuania) and Management Science Letters (Canada)) are included in the highest quartiles: Entrepreneurship and Sustainability Issues Q-1, Management Science Letters Q-2. Only one edition among five (Eastern-European Journal of Enterprise Technologies) is Ukrainian and refers to Q-3.

Results and Discussion

Content analysis of NUS scientists' publications proves a high degree of relevance of OA to enhance publishing activity and better presentation of scientific results both for individual scholars and the university as a whole. During the study, the following results were obtained: the percentage of NUS scientists' publications is expanding at a fast rate. From the 162 documents of the OA, presented in the institution's profile in the Scopus database, 152, which are 94%, were indexed in the last five years. These 152 documents are 41% of the total number of indexed publications over 2017-2021; the GoldAPC model is the most popular among all publications published in OA by the University authors-scientists (26% in 2017 and 38% in 2020; TOP-5 includes University scientists who published more OA documents for a certain period: Doctor of Economics, Professor Irtishcheva I. O., Doctor of Technical Sciences, Professor Blitsov V. S., Doctor of Economics, NUS Professor Boyko E. O., Doctor of Technical Sciences, Professor Serbin S.I., Doctor of Technical Sciences, NUS Professor Trohymenko G. G. There is a significant increase both in international cooperation and the content of the inter-institutional collaboration when creating open resources. The largest increase in the number of publications of NUS authors was affirmed in such branches as Business, Management and Accounting (76%), Energy (73%), Environmental Science (70%), Mathematics (55%), Social Sciences (49%), Engineering (43%), Computer Science (54)), Earth and Planetary Sciences (43%). The citation of publications for the period 2019-2021 increased significantly. The publications received more citations in 2021 (193), 2020 (149), 2019 (46).

Conclusions

During the study, the authors proved that complete and objective evaluation of the scientific activity efficiency of the institution is possible only with the analysis of open resources of scientific information; the percentage of publications in OA of NUS authors-scientists is expanding at a fast rate; the number of scientific articles has increased twice (45 in 2020 against 20 in 2017) for five years; the number of highly-cited publications is very small, only 1.2% of the total number of documents of OA for 2017-2021; publications of the "Top" list are not the editions of Ukraine, and the Ukrainian editions in which the authors are most often published, unfortunately, are not highly-rated; publications in most cases are the completion of a large number of co-authors, in particular foreign, which is due not only to international or inter-institutional collaboration but also with a high cost of publications.

In order to increase publishing activity, we propose to intensify activity in the following areas: a permanent expansion of publications range in international highly-rated scientific reviewed editions of OA, which are included in the scientometric databases; promoting the inclusion of University's own scientific publications at Scopus database and Web of Science; creation of international and inter-institutional collaborations; material and immaterial stimulation of authors for publishing in highly-rated publications of OA, which are indexed in the scientometric databases; placing their works in specialized archives and OA repositories;

creation and updating of author's profiles in scientific social networks. However, special attention should be paid to the quality of scientific publications (novelty, practical significance of research, English language in publications).

Research materials can be used to further increase of publishing activity both for individual scientists and the institution as a whole, because open access as a new model of distribution of scientific information, very actively affects this process.

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БІБЛІОМЕТРИЧНИЙ АНАЛІЗ ПУБЛІКАЦІЙ НАУКОВЦІВ У ЖУРНАЛАХ ВІДКРИТОГО ДОСТУПУ ЯК ІНСТРУМЕНТ ПІДВИЩЕННЯ ПУБЛІКАЦІЙНОЇ АКТИВНОСТІ ВИШУ

Мета. Дослідження спрямовано на підвищення публікаційної активності та кращого представлення наукових результатів Національного університету кораблебудування імені адмірала Макарова шляхом збільшення наукових публікацій у журналах відкритого доступу. Хронологічні рамки досліджуваних наукових статей – 2017-2021 рр. **Методика.** З метою отримання релевантних емпіричних даних авторами дослідження проведений аналіз публікацій вчених НУК ім. адм. Макарова у журналах відкритого доступу з використанням продуктів і сервісів наукометричної БД Scopus. Розглянуто алгоритм «покрокових» дій у базі даних Scopus щодо: визначення найбільш актуальних тем; формування кола найбільш цитованих публікацій; визначення рівня представництва в базі даних Scopus публікацій вчених університету за темою дослідження. **Результати.** Під час дослідження авторами доведено, що повне та об'єктивне оцінювання ефективності наукової діяльності установи можливе тільки з урахуванням аналізу відкритих ресурсів наукової інформації; доля публікацій у відкритому доступі авторів-науковців НУК ім. адм. Макарова зростає: за п'ять років кількість наукових статей відкритого доступу зросла у два рази; найбільш популярною моделлю публікацій є GoldAPC; найбільш цитовані публікації у зарубіжних виданнях, які відносяться до першого і другого квартилю. **Висновки.** Наукова новизна. Авторами вперше було проведено бібліометричне дослідження публікацій науковців у журналах відкритого доступу як інструменту підвищення публікаційної активності вишу на основі продуктів і сервісів наукометричної БД Scopus. Практична значимість. Матеріали дослідження можуть бути використані для подальшого підвищення публікаційної активності як окремих вчених, так і установи в цілому.

Ключові слова: Національний університет кораблебудування імені адмірала Макарова; Наукова бібліотека; відкритий доступ; публікаційна активність; наукометричні показники; наукометричний аналіз; бібліометричне дослідження; Scopus

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