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Status of Open Access Repositories in the Maritime Field: A Review of OpenDOAR

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ABSTRACT

Maritime is a domain dealing with marine engineering, navigation, shipping and ports, ocean engineering, logistics and transportation and many other areas. Maritime domain has not been much explored in terms of its Open Access (OA) related content. Open Access Resources (OAR) have contributed immensely in making available vital information freely accessible on the web. The OpenDOAR serves as a quality-assured global directory of open access repositories, providing open access to academic research outputs and other electronic resources. This study assesses the expansion and evolution of OARs in the maritime domain, examining their key characteristics including coverage, open access policies, software and content types, annual growth trends, and contributions at the country level. The study used OpenDOAR, a global directory of open access repositories for identifying the maritime related OARs. Various key terms associated with maritime field were employed to find comprehensive list of maritime related OARs. The study found 43 OARs of different kinds related maritime. The study found that Ukraine has more maritime related OARs compared to any other countries. Institutional repositories (IR) are the most common type (81.40 %), followed by disciplinary (13.95 %) and governmental (4.65 %) related OA repositories. Open source software DSpace was the most favoured repository application among OAR developers. It is journal articles that have been featured or found most often in maritime relate OARs compared to any other content type. The study highlights the importance of OARs in preserving and disseminating scholarly knowledge in the maritime field and suggests the need for institutions to adopt open access policies to make research more accessible.

Keywords: Maritime; Open access repositories; Open access resources; OpenDOAR; Marine; Digital repositories; Institutional repositories; Digital libraries

1. INTRODUCTION

The maritime domain, a vast expanse of oceanic exploration and industry, has always been closely intertwined with the study of marine ecosystems, naval architecture, maritime law, marine engineering, navigation, ocean engineering, ports administration and the global shipping industry[1-2]. The researchers and stakeholders in the maritime sector constantly seek access to valuable information and resources. In this era of digital information, Open Access Repositories (OARs) have emerged as powerful vessels, facilitating the dissemination of knowledge across this expansive maritime landscape[3]. Among these navigational aids, the OpenDOAR stands as a lighthouse, guiding those interested in maritime affairs to a treasure trove of freely accessible information[4].

The maritime domain encompasses a multitude of subjects, each with its unique challenges and opportunities. From marine biology to maritime engineering, from oceanography to shipping logistics, understanding the maritime world requires access to a diverse array of scholarly materials. OARs have emerged as essential knowledge platforms in this pursuit, offering a gateway to academic research, industry reports, policy documents, and a wealth of data. OARs have greatly helped institutions across the globe to be more visible through their research output accessible openly by anyone & from anywhere thus it has also increased institutional prestige[5]. Open access research publications have also played significant role during the COVID-19 pandemic in mitigating the spread of virus by making available scholarly literature freely to the global scientific community[6].

The purpose of this research paper is to embark on a journey of exploration within the maritime sector, with OpenDOAR as the guiding information source. Through this investigation, we seek to highlight the unique challenges and opportunities faced by the maritime community in accessing right information at the right time and showcase how OpenDOAR addresses these challenges. This study mainly aimed at addressing this gap by examining the expansion and evolution of OARs in the maritime field, with a focus on key characteristics such as coverage, open access policies, software platforms, content types, and country-wise distribution. By analysing data from the OpenDOAR

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directory, this study seeks to provide insights into the current landscape of OARs in the maritime field and their potential impact on research, innovation, and collaboration.

2. OBJECTIVES OF THE STUDY

This study strives to achieve the following:

1. To identify the countries which are actively contributing to OAR in the Maritime domain.
2. To examine the software platforms or systems used in developing OARs in the maritime subject domain for their creation and management.
3. To explore the nature of content archived within these repositories.
4. To determine the specific subjects or topics covered by the content in Maritime OARs.
5. To monitor the expansion of OARs over time, gaining insights into the progress and acceptance of open access within maritime research.
6. To find that whether maritime related OARs in OpenDOAR adhere to the global OA policy.

3. LITERATURE REVIEW

The literature review provides a comprehensive overview of various studies focusing on the status, growth, and challenges related to open access repositories in different countries and regions. Several studies[7-15] indicates that universities in developing countries face barriers in implementing institutional repositories (IRs), leading to limited representation in directories such as OpenDOAR and Registry of Open Access Repositories (ROAR). Ali, Loan, & Mushatq[16] analyse the composition of scientific repositories in OpenDOAR, highlighting regional and country-wise contributions, repository types, and content archived.

Elahi & Mezbah-ul-Islam[17] examine the status of open access repositories in Bangladesh, emphasising the need for public awareness and lamented on slow progress of open access repositories. Djokovic[18] discusses the growth of open access repositories in Serbia, highlighting their importance and impact on scientific publishing. Wani, Ayoub & Kashtwari[19] study open access repositories in BRICS nations, noting trends and developments, with Brazil leading in repository numbers and web traffic. Iddriss & Al Sarraj[20] explore the low use of electronic resources in West Africa and advocate for more involvement in institutional repositories.

Parrayet[21], *et al*. compare the status of open access repositories in India and China, noting India's promising growth. Khan, Loan & Andrabi[22] focus on the adoption of Web 2.0 tools in Asian repositories, highlighting Japan's leading role. Vasilyeva[23] discusses the use of open-source software in repositories, noting its popularity among Russian universities. Adam & Kaur[24] report on the implementation of institutional repositories in African countries, showing below-average performance. Esh & Ghosh[25] examine the contribution of Northeast Indian universities to the Shodhganga repository. Posigha & Osievo[26] identify obstacles to content recruiting in institutional repositories in Nigeria and South Africa, highlighting issues like lack of awareness and copyright concerns. Oberhiri-Orumah & Baro[27] investigate the development of institutional repositories in Nigerian tertiary institution libraries, highlighting challenges and benefits.

Other studies analysed the growth of repositories in specific fields and countries, such as Mehraj,[28] *et al.* studied the development of open access repositories in the field of ecology and environment", Xavier[29] focused on OA repositories in Brazil, Chakrabarti &Maharana[30] examined library and information science related OA content and repositories. Adewole-Odeshi & Ezechukwu[31] looked at the beginning of OA repositories for showcasing the intellectual growth in Nigeria. Ibrahim & Beigh[32] examined the OA repository development in UK. These studies revealed the predominant use of English in repositories, software preferences, and the need for mandatory institutional repositories in some regions.

Quaresma & Borges[33] highlighted the value of open-access repositories in democratising scientific knowledge, boosting institutional and researcher visibility. Das & Singh[34] emphasised the need for increased community awareness and contribution to IRs, as seen in the case of Chinese repositories, primarily led by the Chinese Academy of Sciences.

Kumar[35] examined Indian contributions to DOAR and DOAJ (Directory of Open Access Journals), revealing that a majority of repositories were created by special libraries, while DSpace and EPrints being commonly used software. Loan & Jan[36] studied e-book repositories and found a dominant presence from the Europe and the USA, particularly using DSpace software.

Gupta,[37] *et al.* focused on BRICS countries, highlighting India's significant contribution to open-access repositories, although only a small percentage had policy support systems, and a limited number of publications were added to the repositories. Similarly, Kalbande[38] & Vyas[39] assessed Indian repositories in DOAR, noting the prevalence of DSpace and EPrints software in creating IRs, undefined policies, and a growth spike between 2005 and 2012. Nazim & Ahmadi[40] have delved into India's open access initiatives, noting the country's higher share of gold OA publications but highlighted issues of poor research quality and inadequate global representation due to publication in local journals, suggesting the need for improved OA policies to make available all the publications through IRs or other central repositories, while Shah[41] evaluated electronic thesis and dissertation repositories, considering their subject coverage, and management issues.

4. METHODOLOGY AND SCOPE

The scope of the study is limited to the OA repositories registered in the OpenDOAR repository directory in the field of "Maritime". This study is an attempt to examine the status of OARs in the field of maritime.

4.1 Data Source

The Directory of Open Access Repositories (OpenDOAR) (https://v2.sherpa.ac.uk/opendoar/) was used for data collection. The OpenDOAR is a quality-assured, global directory of open access repositories. By the end of February, 2024 it has included more than 5873 OARs. This makes the OpenDOAR as the largest database of open access repositories with various types' of scholarly content. The first step in this study was to select OA repositories related to maritime from the OpenDOAR directory. The OARs related to Maritime domain were identified and data was collected from 02nd February 2024 to 19th February 2024.

4.2 Retrieving Documents Using Search Features

The OpenDOAR directory was further explored to retrieve the maritime related repositories using the keywords associated with maritime subject domain. The study identified 117 keywords associated with maritime domain and same has been used to retrieve the repositories related to maritime or marine related subjects. The keywords associated with maritime related subjects were listed.

4.3 Filtering Search Results using Advanced Search Strategy

OpenDOAR allows anyone to refine their search using various filters on its website. One can filter by country, content type, subject, and more. There is an option to select "Marine and Oceanography" or related subject categories together to narrow down the search results.

4.4 Retrieving and Finalising Maritime related OA Repositories

Based on the refinement and with advanced search features it became very easy to identify repositories that are relevant to maritime and its associated domain. By using this narrow down approach of advanced search strategy, the study identified 43 OARs related to maritime.

4.5 Data Analysis and Interpretation

To address the objectives 1, 5, 6 and 7, each repository was visited and collected the data required for the study manually. The collected data was recorded in the MS Excel spreadsheet for further analysis and interpretation. The analysed results were presented in the form of tables. The study used only descriptive statistical methods to analyse and interpret the data collected on maritime related OARs. The data analysed using simple descriptive statistical methods were presented in the form of tables.

5. RESULTS

The primary purpose of OARs is to serve as a central repository for the scholarly output of an institution, or a university or a country. It may be of data produced through research (articles, data associated with research-spreadsheets, lab notebooks, transcripts, simulations, software, models, algorithms, workflows), theses and dissertations, databases, teaching notes, audio-video visual resources, archival materials, and grey literature, etc[42]. This role contributes to the preservation, access, and continuity etc., OARs provide a permanent place for these information resources, ensuring that they are not lost or forgotten over time. This is especially significant in the digital age, where the rapid evolution of technologies can lead to the loss of valuable digital content without proper archiving and preservation efforts[43].

5.1 Distribution of Repositories in the Maritime Domain Based on Key Terms

Among the various subject areas listed in the OpenDOAR, the study limited its search to the field of "Maritime related 117 key terms". A total of 43 repositories were retrieved based on the keywords used to identify maritime related repositories.

Table 1 shows the most common key term is "Marine," with 7 repositories, accounting for 16.28 % of the total. "Transport", "Maritime" and "Environmental" follow closely behind, with 6 and 5 repositories respectively, each representing around 13.95 % and 11.63 % of the total. "Naval Architecture" and "Sea" each have 4 repositories, accounting for about 9 % of the total. Other terms such as "Coastal," "Oceanography," "Maritime," and combinations like "Marine, Environmental" and "Marine, Maritime" each have 1 to 2 repositories, making up the rest of the distribution.

Table 1. Maritime related repositories identified based on key terms

S. No.	Key terms	No. of repositories	%
1.	Marine	7	16.28
2.	Transport	6	13.95
3.	Environmental	5	11.63
4.	Maritime	5	11.63
5.	Naval achitecture	4	9.30
6.	Sea	4	9.30
7.	Coastal	2	4.65
8.	Oceanography	2	4.65
9.	Marine, Environmental	1	2.33
10.	Marine, Maritime	1	2.33
11.	Maritime, Ocean	1	2.33
12.	Ocean	1	2.33
13.	Port	1	2.33
14.	Ships	1	2.33
15.	Transportation	1	2.33
16.	Water, Environmental	1	2.33
	Total	**43**	**100.00**

5.2 Different Types of Open Access Repositories (OARs)

OARs available in different types based on the purpose and the audience it serves. Table 2 depicts that there were 43 repositories in all, out of this 81.40 %

were institutional repositories. The repositories developed to provide access to scholarly works and research data produced by the institution's faculty, students and staff are considered as IRs[44]. Similarly, 13.95 % were "disciplinary oriented repositories" and 4.65 % of repositories were of "governmental".

5.3 Country-Wise Availability of Repositories

Table 3 depicts a total of 20 countries were contributed to 43 OARs in the area of Maritime. Ukraine (13.95 %) has contributed highest number of OARs in the field of maritime, followed by China (11.63 %), the USA (11.63 %), Croatia (9.30 %), and Germany (6.98 %) has also developed considerable number of maritime OARs. Belgium, Colombia, Japan, Peru and the United Kingdom contributed two repositories (4.65 %) each while the remaining 11 countries contributed one repository each. India was spotted in the list with only 1 (2.33 %) repository. OARs are very much vital or essential for showcasing the intellectual output of an institution or country, preserving for posterity and providing access to vital information openly. OARs also facilitate for research collaboration and compliance with funding mandates to make their research open[45].

Table 2. Types of open access repositories

Type of repository	No. of repositories	%
Institutional	35	81.40
Disciplinary	6	13.95
Governmental	2	4.65
Total	**43**	**100.00**

Table 3. Country-wise repositories

S. No.	Country name	No. of repositories	%
1.	Ukraine	6	13.95
2.	China	5	11.63
3.	United States of America	5	11.63
4.	Croatia	4	9.30
5.	Germany	3	6.98
6.	Belgium	2	4.65
7.	Colombia	2	4.65
8.	Japan	2	4.65
9.	Peru	2	4.65
10.	United Kingdom	2	4.65
11.	India	1	2.33
12.	Indonesia	1	2.33
13.	Ireland	1	2.33
14.	Malaysia	1	2.33
15.	Poland	1	2.33
16.	Republic of Korea	1	2.33
17.	Russian Federation	1	2.33
18.	Sri Lanka	1	2.33
19.	Sudan	1	2.33
20.	Sweden	1	2.33
Total		**43**	**100**

5.4 Software Platforms

Open-access repositories are developed in such a way that they are accessible and user friendly, and built using a various type of software and architectural frameworks. Mainly there are two types of OARs software that are available: Open Source (free with source code) and proprietary repository software. Examples of open-source repository software include DSpace, EPrints and Fedora. Some proprietary repository software examples include "Digital Commons" and "Islandora" and others.

Table 4 presents a total of 43 software types used in various countries for the development and management of Open Access Repositories (OARs). DSpace (46.51 %) stand top in the list with highest deployment in developing OARs, while Islandora (9.30 %) and EPrints (4.65 %) are also used in many instances. WEKO, panFMP, iLiswave-J V3, HTML, Greenstone, Fedora, dLibra, Digital Commons, CWIS, CSpace are also used in developing of repositories.

5.5 Content Type

Various types of content, such as scholarly publications (preprints or post-prints), conference papers and other scholarly outputs can be deposited and archived in the OARs[42, 43]. Theses and dissertations are other form content that commonly found repositories[46-47.] Other data that includes in repositories ranges from software codes, simulations, and grey literature[48].

Table 5 highlighted that journal articles (18.18 %) are the main content type that are found in OARs in the field of "Maritime" followed by thesis and dissertations (17.48 %), reports and working papers (14.69 %), conference

Table 4. Repository software platforms

S. No.	Name of the software	No. of repositories	%
1	DSpace	20	46.51
2	Unspecified	6	16.28
3	Islandora	4	9.30
4	EPrints	2	4.65
5	WEKO	1	2.33
6	panFMP	1	2.33
7	Other	1	2.33
8	iLiswave-J V3	1	2.33
9	HTML	1	2.33
10	Greenstone	1	2.33
11	Fedora	1	2.33
12	dLibra	1	2.33
13	Digital Commons	1	2.33
14	CWIS	1	2.33
15	CSpace	1	2.33
	Total	**43**	**100.00**

and workshop papers (11.19 %), books, chapters and sections (11.19 %). A satisfactory number of special items (8.39 %) also form part of these repositories, while learning objects (5.59 %) bibliographic references (4.90 %), data sets (3.50 %), patents (2.80 %) and software (2.10 %) are meagre in number in these repositories. The content types available in open access repositories have the potential to enhance research, support educational initiatives, and facilitate knowledge-sharing and collaboration[46- 48].

5.6 Subject Categorisation of OARs

Organising research publications and other repository content into different subject matter is very much important. This helps users to identify and retrieve relevant research publications and other content more easily through OARs[49-50]. Table 6 indicates that a majority of the OARs were associated with more than one subject domain, and thus multidisciplinary in nature.

Table 5. Content type

S. No.	Types of content	No. of repositories	%
1	Journal articles	26	18.18
2	Theses and dissertations	25	17.48
3	Reports and working papers	21	14.69
4	Conference and workshop papers	16	11.19
5	Books, chapters and sections	16	11.19
6	Other special item types	12	8.39
7	Learning objects	8	5.59
8	Bibliographic references	7	4.90
9	Datasets	5	3.50
10	Patents	4	2.80
11	Software	3	2.10
	Total	**143**	**100.00**

Table 6. Subject content type

S. No.	Subject category	No. of repositories	%
1	Science	36	24.49
2	Humanities	20	13.61
3	Social sciences	18	12.24
4	Technology	19	12.93
5	Engineering	16	10.88
6	Health and medicine	12	8.16
7	Mathematics	15	10.20
8	Arts	11	7.48
	Total	**147**	**100.00**

5.7 Year-Wise of Growth of Maritime Repositories

The growth of open access repositories reflects the increasing importance of OA in research outputs for advancing knowledge and innovation. As more and more researchers and institutions adopt open access practices and making their research output openly accessible, OARs are expected to continue playing a pivotal role in enabling the sharing and dissemination of research outputs, thus advancing human endeavors[51].

Table 7 indicates the highest numbers of repositories (11) were registered in the year 2019 in OpenDOAR, followed by six in 2011 and five in 2006. There were three repositories each registered in the year 2020, 2018, and 2015, respectively. Between 2010 to 2019, 29 OARs were registered in the directory. This shows that in this decade there was considerable interest in developing OARs by the institutions or universities across the globe, this was the period in which OA was much talked among librarians, academics and publishers.

5.8 Open Access Policy Status

The presence or absence of OA policies in repositories is mentioned, with some repositories following OA policies based on their hosting organisation's guidelines. All the

Table 7. Year-wise growth

S. No.	Year	No. of repositories	%
1	2023	1	2.33
2	2022	1	2.33
3	2021	1	2.33
4	2020	3	6.98
5	2019	11	25.58
6	2018	3	6.98
7	2017	1	2.33
8	2016	1	2.33
9	2015	3	6.98
10	2013	2	4.65
11	2011	6	13.95
12	2010	2	4.65
13	2009	1	2.33
14	2008	2	4.65
15	2006	5	11.63
	Total	**43**	**100.00**

Table 8. Open access policy status

S. No.	Details	No. of repositories	%
1	Not-defined	42	97.67
2	Defined	1	2.33
	Total	**43**	**100.00**

repositories considered in the study were analysed to gauge whether these repositories following any of the OA policies or not. Table 8 indicates that except one repositories registered in OpenDOAR no other repositories were followed any of the OA policies in designing and developing their institutional repositories. It is high time that institutions or universities should mandate or adopt OA policies to make knowledge open and available to all.

6. DISCUSSION

The study provides valuable insights into the status and characteristics of OARs in the field of Maritime as catalogued in OpenDOAR. Here, we will discuss some key findings and their implications:

The study identified 43 repositories from 20 countries actively contributing to OARs in the Maritime domain. Ukraine, China, and the United States are among the top contributors, indicating their active involvement in open access initiatives related to maritime research. This information is useful for understanding which countries are actively promoting open access in this field.

The most common key term associated with these repositories was "Marine," followed by "Transport," "Environmental," and "Naval Architecture," indicating the diverse nature of research output in the maritime field.

Institutional repositories (IRs) make up the majority (81.40 %) of OARs in the Maritime field, reflecting the significant role of academic and research institutions in preserving and sharing maritime-related scholarly content. Disciplinary (13.95 %) and governmental (4.65 %) repositories also play a notable role.

The choice of software platforms used for creating and managing OARs is an important aspect of repository infrastructure. DSpace emerged as the most preferred software platform for developing OARs, with 46.51 % of repositories using it followed by Islandora (9.30 %) and EPrints (4.65 %). This information can be helpful for institutions planning to set up or update their own repositories, as it provides insights into popular software choices.

The study shows that OARs in Maritime contain a diverse range of content types, including journal articles (18.18 %), theses and dissertations (17.48 %), reports and working papers (14.69 %), conference papers (11.19 %), books, and more. This diversity reflects the breadth of research output in the field and the potential for various types of content to be shared openly.

The subject categorisation of OARs helps users find relevant research outputs. In this case, the "multidisciplinary" category is predominant, indicating that many repositories cover a wide range of subjects within Maritime. This aligns with the interdisciplinary nature of maritime research.

Analysing the growth of OARs over the years provides insights into the development and adoption of open access in maritime research. The study shows a notable increase in the number of repositories in recent years, with the highest number registered in 2019. This indicates a growing recognition of open access resources in the Maritime domain.

While the majority of repositories do not define specific open access policies, one repository follows a defined open access policy. Establishing and adhering to open access policies can be crucial for making sure that research outputs are openly accessible and aligned with institutional or funding mandates.

7. CONCLUSION

The study concludes by emphasising the need for ongoing support and collaboration between developed and developing countries to promote the OA movement in general and maritime subject domain in particular. It also suggests addressing limitations and barriers to further enhance the accessibility and visibility of scholarly literature. Overall, this study provides a comprehensive overview of the role and significance of OARs in the dissemination of research and the advancement of the OA movement in maritime. It underscores their potential to transform scholarly communication and knowledge sharing on a global scale.

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