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Massive Open Online Courses (MOOCs): A Bibliometric Analysis

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ABSTRACT

Purpose: The purpose of this study is to examine important work on MOOCs by researchers in the form of major contributing universities, sources of funding, authors, journals, keywords, and citation data.

Design/Methodology/Approach: In this study, the researchers assessed by conducting a systematic review of MOOC literature, as other researchers have rightly said that reviewing entails learning from experience. In this study, patterns of research publications within particular topics and historical periods were described using bibliometric analysis, quantitative analysis, and statistical analysis.

Findings: The results of this study's cluster analysis revealed the areas where future academics might focus their efforts on MOOCs for future research. There were a total of 199 entries in the notifications, which were then sorted into seven clusters. Every cluster contains different numbers of items. According to the study's findings, education, e-learning, online learning, massive open online courses, and data mining are the most often used keywords. Mostly, Social sciences and computer sciences articles have the highest contribution to research.

Research Limitation: The current study only makes use of the Scopus database. The study's focus was taken into consideration when selecting the keywords. Only three keywords were used in this study. The sole language employed in this study was English.

Managerial Implications: Tthe paper would help the policymakers Future studies can analyse actual challenges faced by higher education institutions and suggest methods for incorporating MOOCs into the teaching environment to address them. In-depth reporting on real-world case studies can be helpful to academics as well as practitioners.

Originality/Value: The evaluation of selected papers yielded a major contribution and food for thought for both scholars and policymakers.

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Introduction

Digital technology has profoundly altered how people are educated. With the usage of the internet, it is now much easier for learners to be educated. Among all of these changes, the introduction of MOOCs raised the educational landscape to new heights. MOOCs are a crucial instrument that can be utilised to increase everyone's access to top-notch education and chances for lifelong learning, according to Wahid et al., (2020). Massive open online courses (MOOCs) are designed for open access and worldwide participation (Germain, 2019). Online courses that are free to take and accessible to everyone draw much larger audiences than regular online courses (Alraimi et al., 2015). MOOCs strive to provide learners with a comprehensive instructional format. In 2008, Downes and Siemens published Connectivism and Connectivity Knowledge, a book that created the term MOOC (Dhamija & Bag, 2020). "Connectivism and Connective Knowledge (CCK)," the first MOOC, was a course delivered online by "the University of Manitoba's Learning Technologies Centre and Extended Education" and taught by Siemens and Downes (Downes, 2008). A growing number of academic articles on MOOCs have been published since 2008. Several organizations, including Coursera, Udacity, and EDX, launched MOOCs in 2011 that reflected key evolving trends in education. In 2017, "SWAYAM (Study Webs of Active Learning for Young Aspiring Minds)", an initiative of the Indian government to fulfil the three goals of access, equity, and quality, took a stand for making learning easier through the Internet. In higher educational institutions, online learning plays an essential role in enhancing pupils' abilities and expanding their knowledge. MOOCs also promote the concept of lifelong learning. To accomplish this, the rapid development of information and communication technology has had an impact on higher education. The advent of new technologies, such as MOOCs, according to the study, allows learners to get a footing in the competitive world (Alhazzani, 2020). Udacity started creating and providing free MOOCs in 2011. In April 2012, Coursera collaborated with other colleges to create and provide MOOCs. The MITx platform for providing MOOCs was developed by MIT, and later it was renamed edX. Over 30 institutions, including McGill, are members of the non-profit edX consortium, which creates and distributes MOOCs. The consortium has made an open-source version of the platform accessible for other institutions and people to use and improve (Alhazzani, 2020).The researcher's particular objectives are to review previous work by renowned researchers from around the world, identify the most prevalent themes associated with Massive Open Online Courses, and conduct further research (MOOCs) by using bibliometric analysis. Bibliometric analysis, as defined by (Merigó & Yang, 2017) is the quantitative analysis of bibliometric data that offers a broad overview of a research topic that may be categorised by publications, journals, and authors. Through the use of bibliometric indicators dating back to the first articles, the most published papers, the top authors with the highest citations, etc. up until the year 2022, this study offers insights that have never before been identified or analysed in such depth. The research study's other sections cover the research methodology, data management, data statistics, research findings, and research constraints. They are followed by a discussion and a conclusion.

Review of Literature

MOOC is free and open to all kinds of learners in this digital world. In 2011, Thrun and other colleagues at Stanford University presented a free academic course on Artificial Intelligence (AI) to give an educational opportunity for anybody interested in learning about the subject. Even though it was the first time a free course on artificial intelligence was offered to the public with 1,60,000 participants from 190 countries, the enrollment was commendable, and similar activities for MOOCs were established by other universities and institutions in the following years. Open source courses are built on the concept of collaborative writing, in which a big group of people collaborate to create and share information. Several organizations, including Coursera, Udacity, and EDX, debuted important educational developments in 2011 (Alhazzani, 2020). Millions of students from all over the world have enrolled in these courses as a result of important educational developments. Arts, healthcare, biology, social sciences, maths, business, and computer science are just a few of the areas covered by MOOCs. MOOCs allow students to participate simply and freely. Students were inspired by MOOC platforms and their usage, according to the study. Furthermore, learning via

a MOOC was much more effective and efficient. Students who take use of online classes perform well in terms of meeting their needs, and they are highly motivated. MOOCs, according to the study, have a flexible character, which the students love (Tony Cripps, 2014). Students have been fascinated by MOOCs since they can learn new courses, improve their everyday knowledge, and compete for as many certification certificates as practicable (Hew & Cheung, 2014).

A systematic evaluation of the MOOC literature that had been published between 2008 and 2012 was presented by Liyanagunawardena et al., (2013). For this review, 45 peer-reviewed papers were found by journal searches, database searches, web searches, and chaining from other well-known sources. Zheng & Yang, (2017) chose 45 papers from the "Chinese Social Science Citation Index (CSSCI)" from 2013 to 2016 that focused on educational studies of MOOCs for bibliometric analysis. A thorough and coordinated analysis of 32 papers on the use of MOOCs in Malaysian higher education (HE) from 2012 to 2017 was provided by Al-Rahmi et al., (2018). Lambert, (2020) presents the findings of a thorough review of 46 studies and reports published between 2014 and 2018. Moreno-Marcos et al., (2019) chose 88 papers to survey the state of the art on prediction in MOOCs by using the systematic literature review (SLR) method. Veletsianos & Shepherdson, (2015) observed that although an interdisciplinary tendency was also developing, researchers from education and computer science conducted the majority of the MOOCs research published from 2013 to 2015. According to Wahid et al., (2020), several studies have examined the interdisciplinary features of MOOC research. According to Zhu et al., (2018) the majority of the research on MOOCs came from the U. S., U. K., Spain, and China. All of these studies are crucial for providing information on how previous research in this field has been conducted and ultimately for future prediction. Bibliometric analysis, as defined by Merigó & Yang, (2017), is the quantitative analysis of bibliometric data that offers a broad overview of a research topic that may be categorized by publications, journals and authors. Through the use of bibliometric indicators dating back to the first articles, most published papers, the top authors with the highest number of citations, etc. up until the year 2022, this study offers insights that have never before been identified or analysed in such depth.

Research Methodology and Data Statistics

In this study, patterns of research publications within particular topics and historical periods were described using bibliometric analysis, quantitative analysis, and statistical analysis. Finding a keyword for search purposes was a step in the process. "A comprehensive assessment of chosen papers contributes greatly to the corpus of literature" (Dhamija & Bag, 2020). The proper selection of keywords is critical in the systematic literature review. It consisted of five stages: screening, assembling, organising, drafting, and ultimately, presenting the findings (Tatham et al., 2017). In the current study, a similar method was used to conduct a structured literature review followed by a forecast of the future scope of work concerning Massive Open Online Courses (MOOCs).

Keywords Used for Research

The researchers began by selecting terms such as "Massive Open Online Courses (MOOCs)", "MOOCs", and "MOOC". This paper shows how this strategy has benefited learners, administrators, and policymakers in particular. One of the accessible databases is used to conduct systematic literature reviews. Scopus, Web of Science, and Science Direct are three of the most popular online databases. For this project, the researcher has chosen to use the Scopus data- base. Utilizing terms in the Scopus database, a total of 6908 research papers were found. The majority of the articles offered are from diverse fields (Social Sciences, Psychology, Engineering, Business Management, Computer and Accounting, etc.). From 2008 to 2022, 949 research publications were abstracted from Scopus and directed toward Massive Open Online Courses (MOOCs) (until 6th May). Furthermore, the researchers concentrate on completely published research publications, omitting manuscripts in preparation, book chapters, editorials, and conference papers. Contribution of, publication year, articles source, author(s), abstracts and papers affiliation are all included in the list of identified research publications. Only English language and journal sources were used for extracting research papers. The researchers applied

certain filters to primary research by using limited subjects, such as social sciences, business management, engineering, psychology, computer science, accounting, arts and humanities, and economics. Finally, 893 research papers in RIS format were produced. The current work is solely concerned with "Massive Open Online Courses (MOOCs)," "MOOCs," and "MOOCs."

Descriptive Statistics

Descriptive statistics gave the information of articles as yearly publication, top 10 authors, top 10 countries, affiliation-wise, journal-wise, subject classification, and top 10 funding sponsors information from the Scopus database. The first part of the description is about the release of papers about Massive Open Online Courses (MOOCs) on an annual basis (Table 1 and Figure 1). Between 2008 and 2022, there was a significant input of papers. (893 items; available till the 6th of May 2022). According to (Table 1, and Figure 1), the number of publications each year is growing from 2018 forward. This research includes a list of the top ten authors' contributions. This survey also included a list of the Top 10 Journal-wise Publications. Future scholars working on MOOCs in the last fifteen years will find the knowledge of MOOCs quite beneficial.

The most widely read periodicals when it comes to working The separation of papers by affiliation provides valuable statistics for researchers and academicians in the field (refer to Table 2 and Figure 2). This section contains a list of the world's leading institutions that are making significant contributions to research outputs in the field of Massive Open Online Courses (MOOCs). Universidad Carlos III de Madrid (17 articles), The Open University (19 articles), Tecnologico de Monterrey (17 articles), and so on are among the most active universities (refer to Table 3 and Figure 3). Because technological improvement research is in great demand across the world. The rest of the institutions might learn something new from this analysis.

The researchers also identified the top ten countries with the number of papers so that future researchers may take the essential information and move forward with their study on MOOCs. The United States of America (USA) ranks first with 159 items, followed by China with 125 items, and so on (refer to Table 4 and Figure 4). With only 24 items, India is among the top 20 countries.

Table 1: Year-wise Publication

Documents Year-wise	No. of Documents
2009	1
2010	0
2011	2
2012	1
2013	12
2014	46
2015	77
2016	58
2017	78
2018	129
2019	130
2020	129
2021	172
2022	58

Source: *Scopus database, 2008-2022 (6th of May) and compiled by the author.*

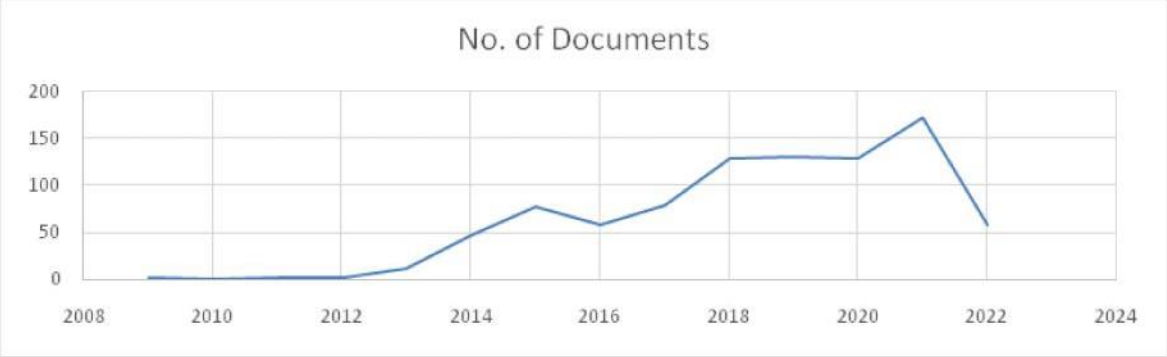

Figure No.1: Year-wise Publication

Source: *Scopus database, 2008-2022 (6th of May) and compiled by the author.*

Table 2: Journal-wise publication

Documents by Source	No. of Documents
International Review of Research In Open and Distance Learning	93
International Journal of Emerging Technologies In Learning	69
Sustainability Switzerland	39
IEEE Access	32
Computers snd Education	25
Turkish Online Journal of Distance Education	23
Education Sciences	20
Online Learning Journal	17
International Journal of Educational Technology In Higher Education	15
Comunicar	13

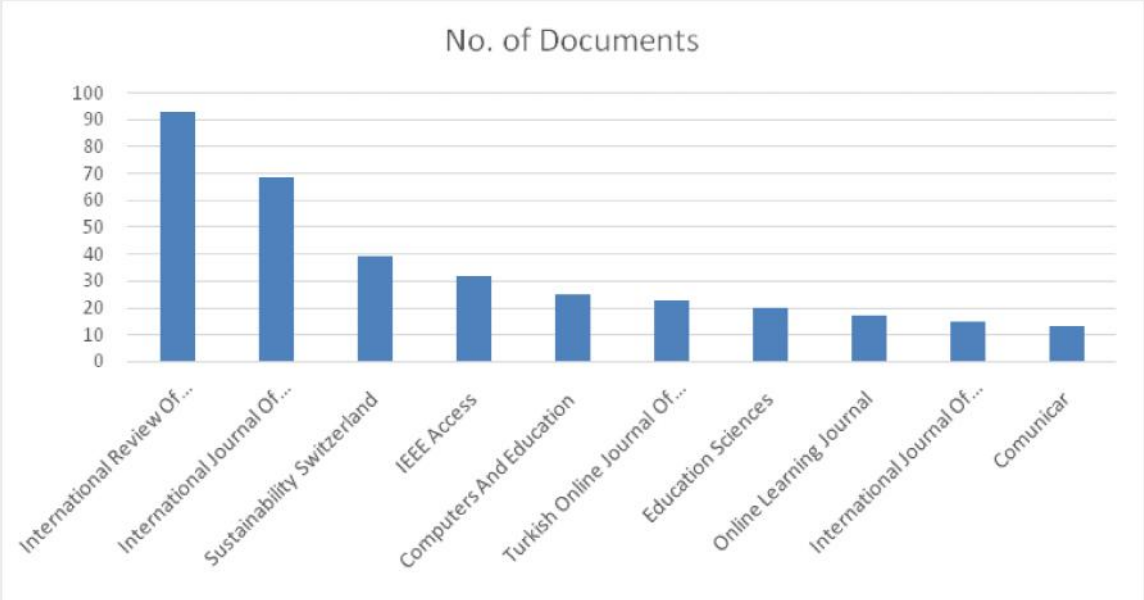

Figure No. 2: Journal-wise Publication

Source: *Scopus database, 2008-2022 (6th of May) and compiled by the author.*

Table 3: Affiliation-wise Publication

Documents by Affiliation	No. of Documents
The Open University	19
University Carlos III of Madrid	17
Technology of Monterrey	17
Massachusetts Institute of Technology	17
Open University	17
The University of Edinburgh (UK)	15
University of Murcia, Spain	12
National University of Distance Education	12
University of Alicante, Spain	10
The Open University of Catalonia, Spain	9

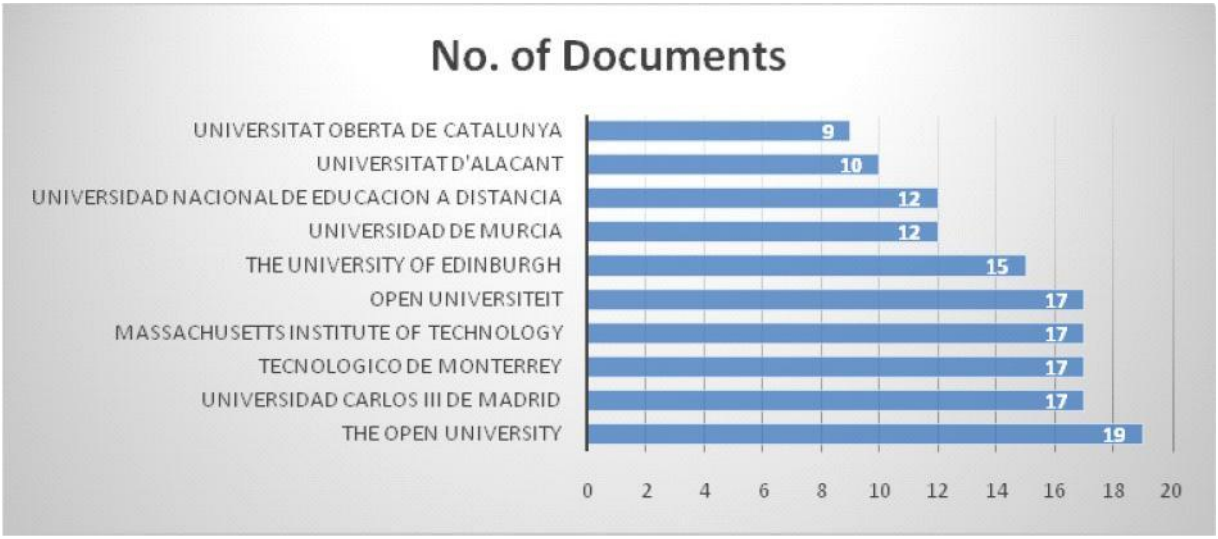

Figure No. 3: Affiliation-wise Publication

Source: *Scopus database, 2008-2022 (6th of May) and compiled by the author*.

Table 4: Country-wise Publication

Documents by Country	No. of Documents
United States of America	159
China	125
Spain	120
United Kingdom	112
Malaysia	47
Australia	45
Netherlands	45
Canada	30
Germany	27
Russian Federation	27

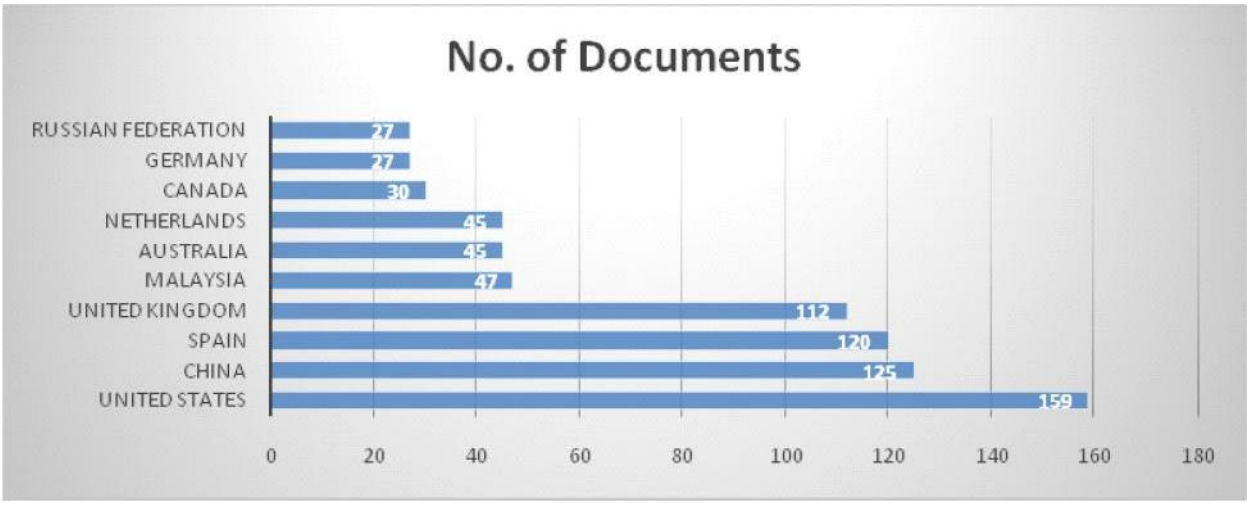

Figure No. 4: Country-wise Publication

Source: *Scopus database, 2008-2022 (6th of May) and compiled by the author.*

Funded research serves an essential function and provides proof in the field of research, demonstrating that institutions have made significant progress. This research also includes a list of potential financing sources for MOOCs. These findings may be helpful for future researchers in obtaining funding (refer to Table 5 and Figure 5)

This section contains details on each publication's subject. Almost all topics are addressed in this list. It indicates that Massive Open Online Courses (MOOCs) are becoming increasingly popular and beneficial in a variety of fields (Table 6 and Figure 6).

Data Analysis and Findings

This section contains the writers' analytical results as well as keyword statistics. The researchers use bibliometric analysis and network analysis to conduct their research.

Bibliometric Analysis

It is a research discipline that aids in identifying the most active, most referenced authors and institutions, the most significant, relevant papers, and the most often used keywords.

Influence of the author: MOOC research is at an all-time high in the fast-paced and

Table 5: Funding Sponsor-wise Publication

Documents by Funding Sponsors	No. of Documents
European Commission	42
National Natural Science Foundation of China	31
European Regional Development Fund	21
Ministry of Economy and Competitiveness, Madrid, Spain	14
National Science Foundation, United States	12
Horizon 2020 Framework Programme	8
Ministry of science innovation and Universities, Madrid, Spain	8
State Research Agency, Madrid, Spain	7
Ministry of Science and Technology, Taiwan	7
Fundamental Research Funds for the Central Universities	5

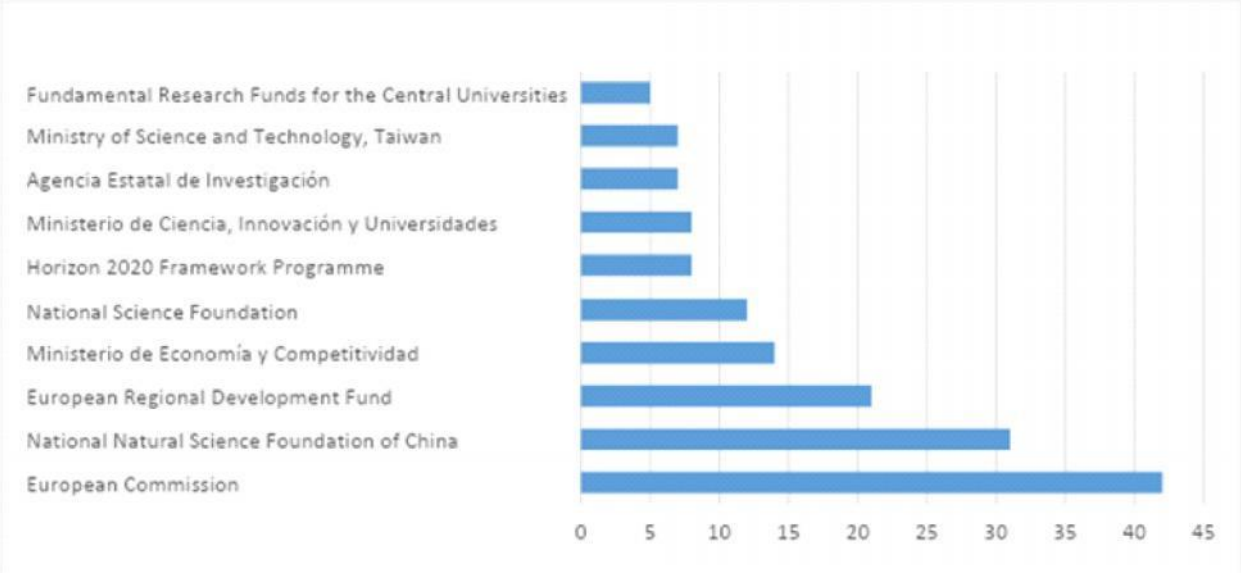

Figure No.5: Funding sponsor-wise Publication

Source: *Scopus database, 2008-2022 (6th of May) and compiled by the author.*

Table 6: Subject-wise Publication

Documents by Subject Area	No. of Documents
Agricultural and Biological Sciences	8
Arts and Humanities	39
Biochemistry, Genetics and Molecular Biology	11
Business, Management and Accounting	38
Chemical Engineering	11
Chemistry	4
Computer Science	367
Decision Sciences	11
Earth and Planetary Sciences	6
Economics, Econometrics and Finance	11
Energy	40
Engineering	197
Environmental Science	52
Health Professions	18
Materials Science	39
Mathematics	41
Medicine	12
Multidisciplinary	1
Neuroscience	9
Nursing	1
Pharmacology, Toxicology and Pharmaceutics	1
Physics and Astronomy	9
Psychology	61
Social Sciences	668
Veterinary	1

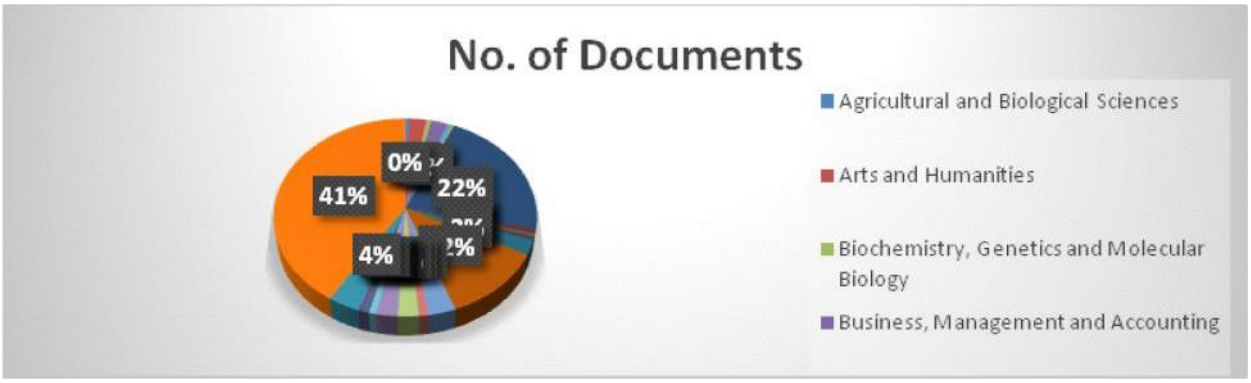

Figure No. 6: Subject-wise Publication

Source: *Scopus database, 2008-2022 (6th of May) and compiled by the author.*

competitive world of technology. In the same way, researchers are working in this field. The researchers published a large number of publications in this domain, such as Alario-Hoyos, C. (13 articles). The results show that the author(s) are quite interested in researching and contributing to Massive Open Online Courses (MOOCs) in general (Table 7 and Figure 7).

Statistics on Keywords. In the field of research, keywords are quite significant. Figure No.8 shows a list of the most commonly searched terms in this investigation. It signifies that MOOC is the most important term. Massive Open Online Course, e-learning, education, online learning, open education, and data mining are the most widely searched terms. In this investigation, the researchers discovered seven clusters after employing this visualization technique. There were a total of 199 entries in the notifications, which were then sorted into seven clusters. The clusters are given by VOSviewer software from the items. These clusters are given below in this table.

MOOCs are becoming increasingly popular across the world, as seen in Figure 9. It demonstrates how the country aided MOOCs. The USA contributed the most to the study, followed by Spain, the United Kingdom, and so on. The Big Bubble depicts the country's biggest number of research projects. The yellow bubble indicates that they have only recently begun contributing to research via MOOCs, e.g. India, Indonesia, and other countries are in the yellow category.

Table 7: Top 10 Authors

Documents by Author	No. of Documents
Alario-Hoyos, C.	13
Muñoz-Merino, P.J.	10
Kalz, M.	9
Ruipérez-Valiente, J.A.	9
Kloos, C.D.	8
Zhu, M.	8
Costello, E.	7
Gaševiæ, D.	7
Joksimoviæ, S.	7
Kovanoviæ, V.	7

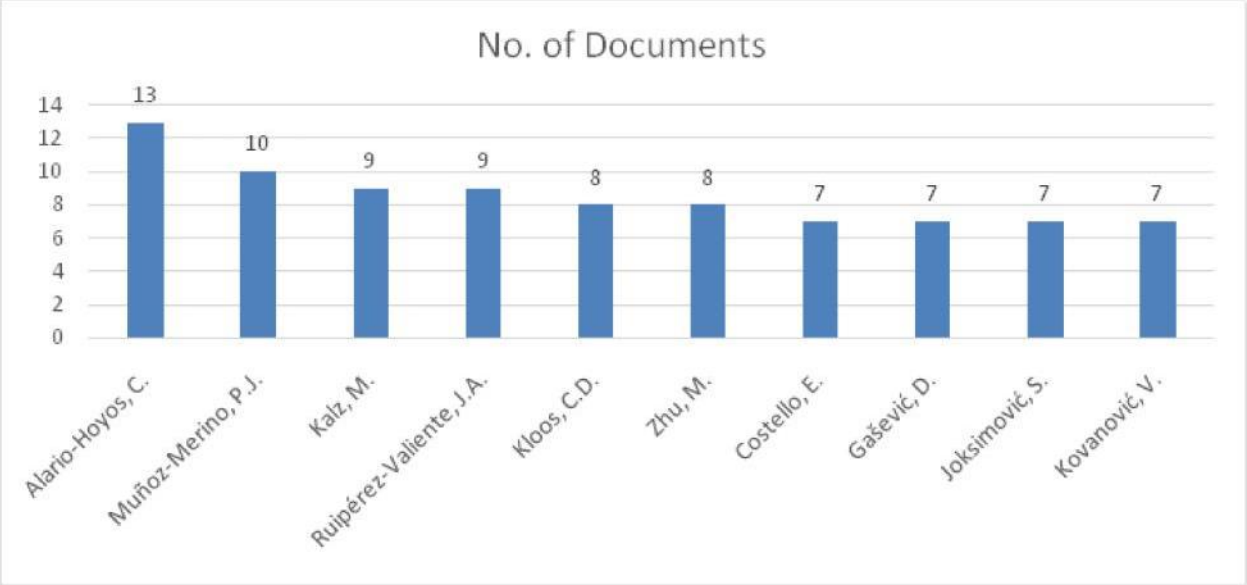

Figure 7: Top 10 Authors

Source: *Scopus database, 2008-2022 (6th of May) and compiled by the author.*

Table 8: Different Clusters Found in this Study

Number of the clusters	Items under the different Clusters
Cluster 1	Assessment, Bioinformatics, Biology, communication, computational biology, Computer-assisted institutes, Controlled study, data analysis, education.
Cluster 2	Algorithm, automation, big data, gamification, data handling, data mining, decision trees, deep learning, deep neural network,
Cluster 3	Adult learning, artificial intelligence, computer-supported company, educational technology, engineering education, in-depth interviews, learning communities, lifelong learning, metadata, and online systems.
Cluster 4	MOOCs, connectivism, decision-making, distance education, e-learning, electronic assessment, engagement, gamification, grading, and instructional design.
Cluster 5	Behavioural research, collaborative learning, computer programing, discussion form, educational data mining, learning analytics, learning environments, learning process, learning systems, and machine learning technologies.
Cluster 6	Blended learning, higher education, innovation, knowledge, massive open online course, MOOCs, OER, online education, sustainable development.
Cluster 7	Academic performance, distance learning, educational institutions, learning experiences, student satisfaction, virtual learning.

Findings

Theoretically, this study examines the contributions of the authors as well as relevant data presented in the literature on Massive Open Online Courses (MOOCs) nowadays. The identification of institutions, countries, and writers is another

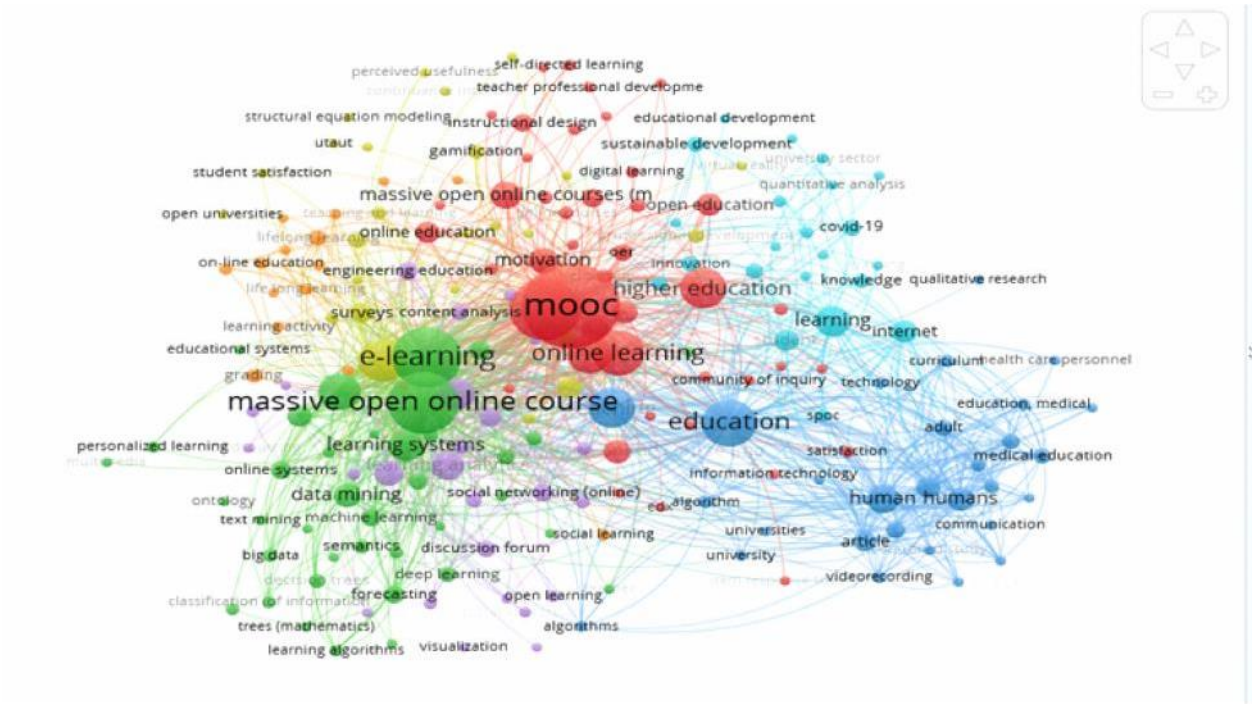

Figure No. 8: Commonly used keywords

Source: *Scopus database, 2008-2022 (6th of May) and compiled by the author.*

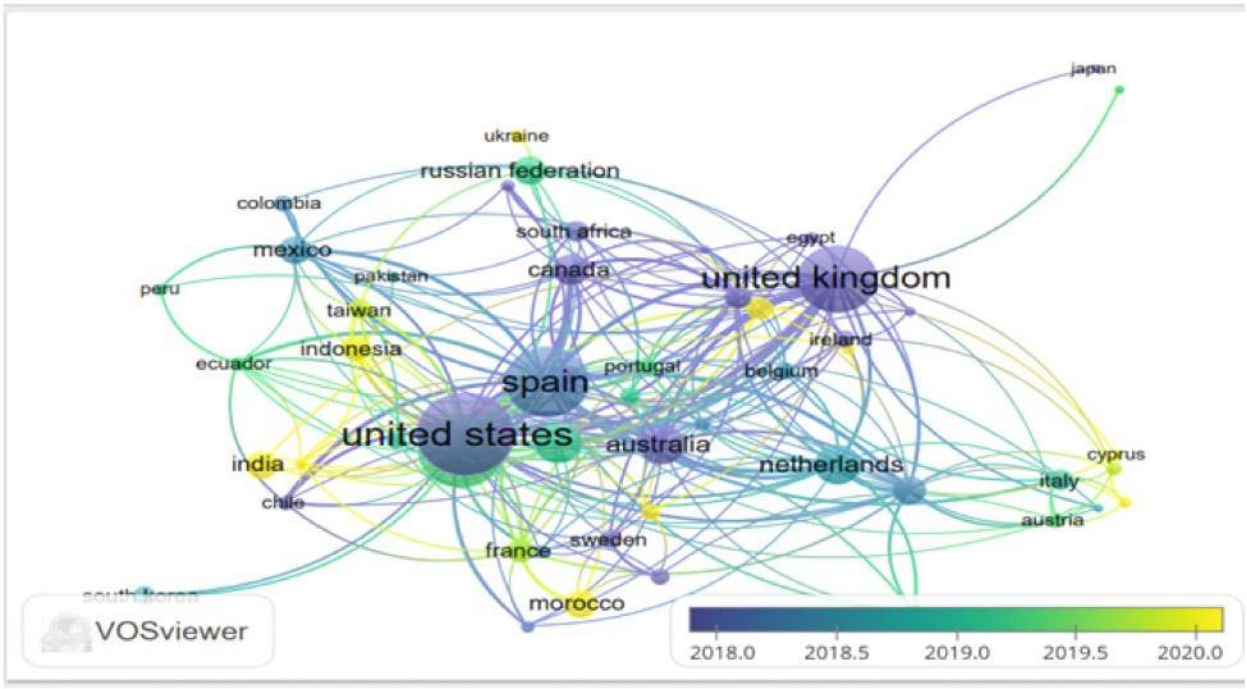

Figure No. 9: Country-wise Contribution to Research

Source: *Scopus database, 2008–2022 (6th of May) and compiled by the author.*

distinctive aspect of this study. Academics, students, researchers, and policymakers will gain knowledge about the importance of MOOCs in their particular fields of study and work. Academics, learners, researchers, and decision-makers must assess the concerns raised in this article, encompassing what has occurred as well as potential future measures to stop technology catastrophes and foster favourable scenarios that foster long-term progress in the learning environment. Policymakers should take into account each element of this research study as they evaluate their ability to function in the future. According to the study's findings, education, e-learning, online learning, massive open online courses, and data mining are the most often used keywords. Mostly, Social sciences and computer sciences articles have the highest contribution to research. Top most top journal with the highest publication is the International Review of Research in Open and Distance Learning. MOOC is a highly used keyword in research. The Open University is the top university. U.S., U.K., China and Spain have made the most substantial contributions to this topic.

Discussion and Conclusion

According to Booth, (2016), the audience, goal, and targeted deliverables all have an impact on how the data are found, acquired, and presented. The involvement of people from various local contexts and backgrounds during the consultation process shows equality, which is crucial when developing MOOCs (King et al., 2018). This research also demonstrated that research on MOOCs is multidisciplinary and collaboratively carried out over the globe. The findings of the study support the previous studies that show There is a fair degree of international scientific cooperation in MOOCs research, as shown by our analysis of nations, citations, institutions, and authors. Even though Liyanagunawardena et al., (2013) , bibliometric research of MOOCs included their first introduction (i.e., 2008 to 2013) this study used academic papers from the Scopus database to provide in-depth knowledge on MOOCs. According to Wahid et al., (2020) Scopus gave results of 3,118 documents, found several terms linked to MOOCs research, including MOOC, MOOCs, MOOCAT, MOOCEP, and MOOC-topia and dealt with various questions and objectives. The three keywords utilised in this study – are MOOCs, Massive Open Online Courses (MOOC), and MOOCs. The findings of this study support previous studies that the number of research papers grew steadily for 10 years. Citations of works by writers from different nations suggest that they are aware of the global nature of their scientific community, which may help shape scientific paradigms (Pan et al., 2012). Bibliometric analysis results showed the growth of publication rates has increased every year. Most of the articles published in international journals in Social Science use the Web of Science. This study also used Elsevier's Scopus using approaches with common keywords MOOC, MOOCs, Massive Open Online Courses, Online Learning, and Higher education most common keywords all over the years. united states.

Limitations of the Study and Future Areas of Research

The current study only makes use of the Scopus database. The study's focus was taken into consideration when selecting the keywords. Only three keywords were used in this study. The sole language employed in this study was English. Future researchers might look at the Web of Science and other platforms. Future researchers may use more keywords. another language can be used. Do further study using their areas of interest or study themes. Future researchers may employ a variety of techniques to prepare more imaginatively. For future researchers to continue their research after reading this study. The present literature is just briefly reviewed in this study.The identity of the authors, along with their citations and publications, is the most significant discovery from this study. Readers can use this information to identify gaps, trends, and links between authors' studies and the issues and goals of the study. More research themes can be done by using the given clusters which are found in this paper. Future studies can analyse actual challenges faced by higher education institutions and suggest methods for incorporating MOOCs into the teaching environment to address them. In-depth reporting on real-world case studies can be helpful to academics as well as practitioners.

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