

USING VOSVIEWER SOFTWARE IN COLLECTING MATERIALS OF OVERVIEW RESEARCH

UTILIZAÇÃO DO SOFTWARE VOSVIEWER NA COLETA DE MATERIAIS PARA PESQUISA DE VISÃO GERAL

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Le Thi Tu Oanh*

*University of Labour and Social Affairs, Hanoi, Vietnam

Orcid: <https://orcid.org/0000-0002-2823-2204>

oanhltt.tlkt@ulsa.edu.vn

Hoang Thanh Hanh**

**ThuyLoi University, Kim Lien, Hanoi, Vietnam

Orcid: <https://orcid.org/0000-0001-7034-0105>

hoangthanhhanh@tlu.edu.vn

Le Thi Minh Phuong**

**ThuyLoi University, Kim Lien, Hanoi, Vietnam

Orcid: <https://orcid.org/0009-0007-2876-217X>

minhphuong@tlu.edu.vn

Pham Thi Hong Nhung**

**ThuyLoi University, Kim Lien, Hanoi, Vietnam

Orcid: <https://orcid.org/0009-0001-4720-7215>

Nhungpth_kt@tlu.edu.vn

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Abstract

Research overviews play a critical role in scientific inquiry by enabling scholars to systematically map, evaluate, and synthesize existing knowledge related to a specific research problem. A theoretical research overview, in particular, seeks to integrate concepts, methods, and findings from prior studies in order to explain social and scientific phenomena and to identify gaps that warrant further investigation. Despite its importance, conducting a comprehensive and methodologically sound literature overview remains challenging, especially for early-career researchers and graduate students, who often face difficulties in locating, organizing, and critically assessing large volumes of academic publications. Systematic literature searching is therefore an essential stage in the research process, as it provides a structured approach to identifying relevant studies, understanding theoretical foundations, evaluating methodological trends, and assessing the strengths and limitations of existing research. Recent scholarship emphasizes the value of consensus across multiple literature

Resumo

As revisões de literatura desempenham um papel crucial na investigação científica, permitindo que os pesquisadores mapeiem, avaliem e sintetizem sistematicamente o conhecimento existente relacionado a um problema de pesquisa específico. Uma revisão teórica de literatura, em particular, busca integrar conceitos, métodos e descobertas de estudos anteriores a fim de explicar fenômenos sociais e científicos e identificar lacunas que justifiquem investigações adicionais. Apesar de sua importância, conduzir uma revisão de literatura abrangente e metodologicamente sólida continua sendo um desafio, especialmente para pesquisadores em início de carreira e estudantes de pós-graduação, que frequentemente enfrentam dificuldades para localizar, organizar e avaliar criticamente grandes volumes de publicações acadêmicas. A busca sistemática na literatura é, portanto, uma etapa essencial no processo de pesquisa, pois fornece uma abordagem estruturada para identificar estudos relevantes, compreender os fundamentos teóricos, avaliar tendências



reviews as a key step in ensuring rigor and reliability. At the same time, researchers are increasingly encouraged to engage with open-access data sources that enhance transparency, accessibility, and efficiency in knowledge production. Within this context, scientometric analysis has emerged as a powerful method for examining scientific development across disciplines. By combining quantitative bibliometric techniques with visualization tools, scientometric approaches allow researchers to identify influential publications, authors, institutions, and countries, as well as to track thematic evolution and citation patterns. Although previous studies have successfully applied tools such as VOSviewer using data from databases like Scopus, ScienceDirect, and Google Scholar, there remains a lack of practical guidance on leveraging open-access platforms—particularly OpenAlex—for comprehensive literature collection and analysis. This article addresses this gap by introducing OpenAlex as a valuable and openly accessible data source for systematic literature collection, in combination with VOSviewer software for scientometric analysis. The study demonstrates how researchers can efficiently retrieve, analyze, and visualize scholarly data to gain insights into research trends, citation impact, and knowledge structures. A practical illustration using the keyword “Digital Quantitative Analysis” is provided to guide users through the process. The findings highlight how this approach can significantly reduce time and effort in literature searching while supporting the identification of meaningful research gaps and future research directions.

Keywords: Research overview. Systematic literature review. Scientometric analysis. OpenAlex. VOSviewer.

metodológicas e analisar os pontos fortes e as limitações das pesquisas existentes. Estudos recentes enfatizam o valor do consenso entre múltiplas revisões de literatura como um passo fundamental para garantir rigor e confiabilidade. Ao mesmo tempo, os pesquisadores são cada vez mais incentivados a utilizar fontes de dados de acesso aberto que aprimoram a transparência, a acessibilidade e a eficiência na produção de conhecimento. Nesse contexto, a análise cientométrica emergiu como um método poderoso para examinar o desenvolvimento científico em diversas disciplinas. Ao combinar técnicas bibliométricas quantitativas com ferramentas de visualização, as abordagens cientométricas permitem que os pesquisadores identifiquem publicações, autores, instituições e países influentes, bem como acompanhem a evolução temática e os padrões de citação. Embora estudos anteriores tenham aplicado com sucesso ferramentas como o VOSviewer usando dados de bancos de dados como Scopus, ScienceDirect e Google Scholar, ainda há uma falta de orientação prática sobre como aproveitar plataformas de acesso aberto — particularmente o OpenAlex — para coleta e análise abrangentes de literatura. Este artigo aborda essa lacuna, apresentando o OpenAlex como uma fonte de dados valiosa e de acesso aberto para a coleta sistemática de literatura, em combinação com o software VOSviewer para análise cientométrica. O estudo demonstra como os pesquisadores podem recuperar, analisar e visualizar dados acadêmicos de forma eficiente para obter insights sobre tendências de pesquisa, impacto de citações e estruturas de conhecimento. Uma ilustração prática usando a palavra-chave “Análise Quantitativa Digital” é fornecida para orientar os usuários durante o processo. Os resultados destacam como essa abordagem pode reduzir significativamente o tempo e o esforço na busca bibliográfica, ao mesmo tempo que auxilia na identificação de lacunas de pesquisa relevantes e em futuras direções de pesquisa.

Palavras-chave: Visão geral da pesquisa. Revisão sistemática da literatura. Análise cientométrica. OpenAlex. VOSviewer.

1 INTRODUCTION

Research overview plays a significant role in scientific research. Theoretical overview research is a method designed to develop, through data collection and analysis, a well-integrated set of concepts that theoretically explain a phenomenon—social phenomenon (Kennedy et al.; L. A., 2006). A research overview is a detailed description of problems in previous studies related to the research topic. A research overview helps researchers have an overview of previously published research works related to the research problem, from listing to reviewing and synthesizing information in the research article to improve their understanding of the research problem. Through general research, the researcher will know about issues such as purpose, object, scope, methods, theoretical foundation, and results of previous studies and evaluate the advantages and limitations of previous studies, thereby finding gaps for our research. Cooper C. et al. (2018) suggest that consensus across multiple literature reviews is seen as a ‘key stage’ in the literature search process. However, to be able to do a good research overview, researchers, especially new participants or graduate students, may feel confused about reviewing and collecting comprehensive documents. Concerns point out the need for clarity on the use of literature, in theory, to embark on similar research journeys (McGhee G. et al., 2007).

Systematic literature searches are considered an essential component of the research process. It involves a systematic search for previous research and providing complete information about the research problem, helping the researcher to clearly understand what has been done, thereby identifying relevant research. Research (Cooper, C. et al., 2018). Researchers need to identify sources of high scientific value related to the research field to obtain concepts, definitions, theories of the research problem, and context. Methods used, data collected, and previous studies have solved and have not mentioned this issue, ... The benefits of collecting appropriate documents help researchers pay attention to the appropriateness of the method and theoretical basis; the theoretical model has a basis for explaining and describing any deviations in implementation from this chosen method (Cutcliffe et al. (2000, 2005). In addition, researchers must also be informed about available open-access material.

The scientometric analysis is a widely used method to collect documents and analyze scientific developments in many fields. Some recent studies by Hallinger & Chatpinyakooop (2019), Phan Thi Thanh Thao (2022) in the field of education, Hallinger

& Nguyen (2020) associated with sustainable development, Pham H. -H. et al. (2020), Vu T.T.T. et al. (2023), Le T.T.O et al. (2023) in the field of social sciences, and Nguyen Tien Trung and colleagues (2022) in the field of scientific research. The above studies introduce the role of scientific measurement analysis from VOSviewer software and use the analysis with different fields. Databases are also used in various ways, from paid data sources such as Scopus and Science Direct to open data from Google Scholar and OpenAlex. However, the studies have not targeted researchers to use in collecting general documents, nor have they provided specific instructions on how to do this on the OpenAlex database. This is the gap for this research.

This article would like to introduce a valuable tool for collecting documents in abundant, reliable, and openly accessible quantities, using data on OpenAlex and VOSviewer software. Research results help scholars and researchers understand and apply how to find documents related to the research problem and evaluate the history of the research problem, the most cited publications, and the most widely cited publications. The most prolific and influential scholars, organizations, and countries are publishing on this research issue. This information will help researchers analyze information from previous research and find research gaps. This information will help researchers reduce time and effort in searching for information. The article also directly illustrates how to collect information with the keyword "Digital Quantitative Analysis" on VOSviewer_1.6.19 software to help scholars and researchers use it efficiently in their research.

2 INTRODUCING VOSVIEWER SOFTWARE AND OPENALEX DATABASE

2.1 VOSviewer software

VOSviewer is a software tool for creating maps based on network data and visualizing and exploring these maps (Van Eck & Waltman, 2013). VOS viewer's functions include:

Create maps based on network data: VOSviewer can be used to build networks of scientific publications, scientific journals, researchers, research organizations, countries, keywords, or terms. Items in these networks can be connected by co-authorship, co-occurrence, citation, bibliographic link, or co-citation link. Data from Web

of Science, Scopus, PubMed, RIS, or Crossref JSON files can be used to build the network.

Provides map visualization and exploration: VOSviewer provides three visualizations of a map: network visualization, overlay visualization, and density visualization. Zoom and scroll functions allow detailed map exploration, which is essential when working with large maps containing thousands of items.

VOSviewer has been developed using the Java programming language and can be downloaded from www.vosviewer.com to be used freely for various purposes. The latest version in 2023 is VOSviewer_1.6.19. Content collected from VOSviewer software can help collect diverse information: 1) Analyze the publication volume of related research by keywords; 2) Co-authorship analysis; 3) Analyze keyword co-occurrence; 4) Co-citation analysis of keywords, authors, and documents (co-citation).

- 1) Analyze the publication volume of related research by keywords to show the history of the research problem, fluctuations, and the time of the highest peak, increasing or decreasing trend of the research problem.
- 2) Co-authorship analysis shows how authors connect ideas across published works (Chen et al., 2001). When two authors are frequently cited by different authors (i.e., co-cited), they share intellectual similarities (Hallinger & Suriyankietkaew, 2018).
- 3) Keyword co-occurrence analysis shows that the most popular search keywords appear in related documents (Lozano et al., 2019; Radhakrishnan et al., 2017). Through analyzing the co-occurrence of keywords, researchers can identify topics of interest related to each other, explore topic structure, and identify topics of research interest. Moreover, it reveals research trends (Zupic & Čater, 2015). Radhakrishnan and colleagues (2017) also assert that this analysis technique can be performed quickly on large documents, producing a knowledge map and insights before a rigorous systematic review.
- 4) Co-citation analysis is used to identify prominent keywords, authors, and documents in knowledge fields (Zupic & Čater, 2015). Co-citation occurs when, in two papers, the author receives a citation from the same third document on the research problem. The interface of VOSviewer software is shown in Figure 1.

Figure 1

Interface of VOSviewer software

(1) Main panel, (2) Option panel, (3) Information panel,
(4) Overview panel and (5) Action panel.



Sources: Van Eck & Waltman, 2013

2.2 OpenAlex open database

OpenAlex is an entirely open directory of global research systems. It is named after and implemented by a non-profit organization (Van Eck & Waltman, 2013). The OpenAlex dataset describes academics and how those entities are connected. Entity types include article, author, source, concept, publisher, and sponsor. OpenAlex provides an alternative to industry-standard scientific knowledge bases such as Elsevier's Scopus and Clarivate's Web of Science. With these paid services, OpenAlex offers significant advantages in comprehensiveness, affordability, and availability.

The advantages of the OpenAlex database are:

Ample - Twice the coverage of other services and has significantly better coverage of non-English works and works from the Global South.

Easy - Fast, modern, and well-documented service.

Open - The complete dataset is free.

From user reviews, individuals and organizations have found great value in using OpenAlex.

3 RESEARCH RESULTS

Illustration of general collection for the keyword "Digital Quantitive Analysis" using the database available on OpenAlex of VOSviewer_1.6.19 software.

The author used VOSviewer 1.6.19 software to filter data with the keyword "Digital Quantitive Analysis" screened in the Abstract of the OpenAlex database, accessed December 20, 2023. Results were obtained from 21 Related articles. Based on this data, the author performs analysis according to the following contents:

- (1) Analyze the number of articles about "Digital Quantitive Analysis" published over time. This analysis will clarify related research questions such as the number of publications over time, fluctuations, and trends in this publication.
- (2) Co-author analysis: answers the question of understanding the relationship between two authors, determined when at least one simultaneous citation exists in a document. In addition, this analysis also shows that these authors are related in terms of sponsoring organizations (schools) or countries.
- (3) Co-keyword analysis shows that the term appears frequently in these studies.
- (4) Co-citation analysis: Most cited documents; Author with the highest number of articles and citations; The university has the highest number of articles and citations; Country with the highest number of articles and citations.

The keyword filtering interface on VOSviewer_1.6.19 software is shown in Figure

2.

Figure 2*Keyword filtering interface on VOSviewer_1.6.19 software*

Source: Author analysis from VOSviewer_1.6.19 software

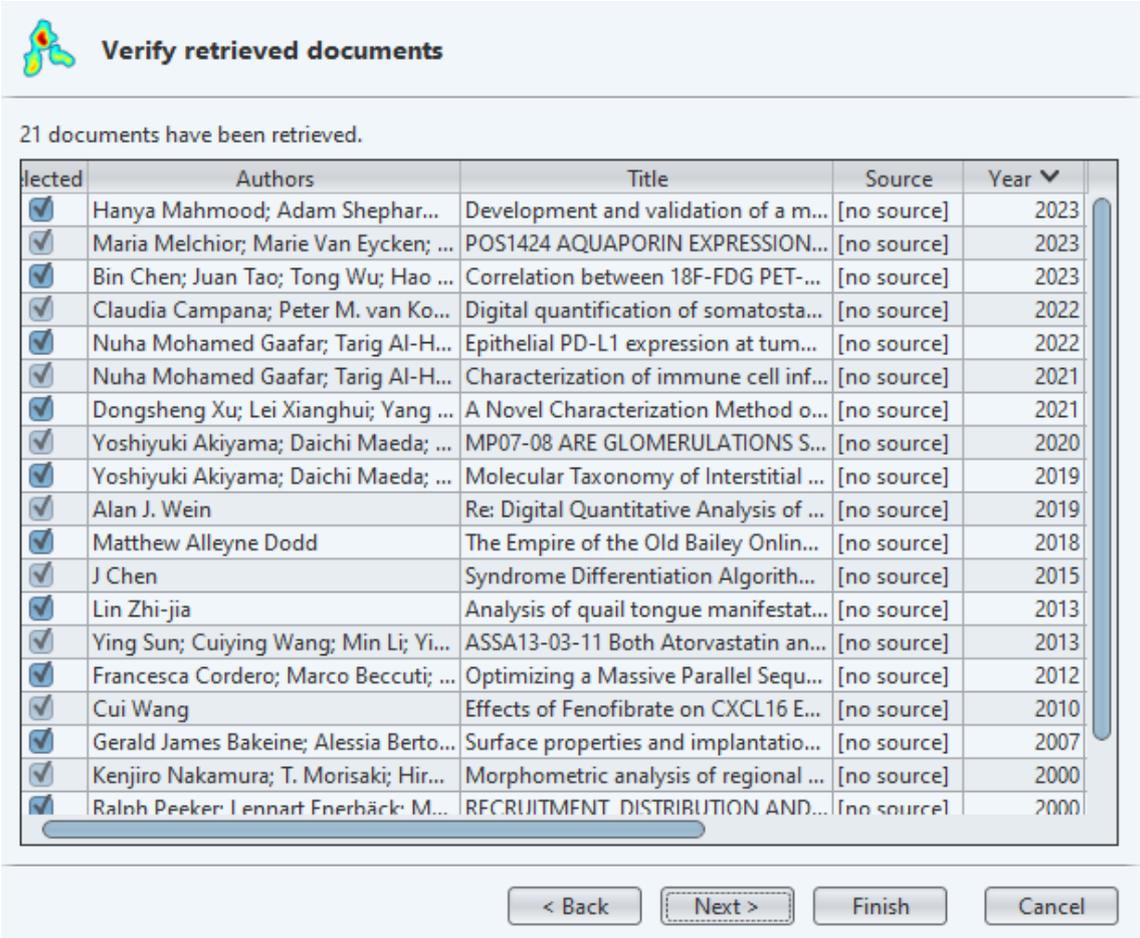
3.1 Analyze the number of articles about “Digital Quantitive Analysis” published over time

Keyword search results are shown in Figure 3. The collected information includes the author's name, article title, source, and year of publication. With this result, researchers can list publications by year. On that basis, researchers can draw graphs from Excel software and evaluate the information for the earliest related articles, the number of published fluctuations, peaks, and future trends from past volatility. Past (Figure 4). This result helps the researcher answer research question number 1. With the results of Figure 4, the information collected shows that the article related to the keyword "Digital Quantitive Analysis" appears in the Abstract.) of articles with the earliest publication in

1996. Research on this issue has attracted scholars since 2007. However, the number of studies is small; by 2023, there will be three articles. Figure 5 is a suggestion for using more comparative information about related phrases, for example, in an overview study of the issue related to “Quantitative analysis of economic and social issues in the digital environment” with two keywords, “Digital Quantitative Analysis” and “Economics Quantitative Analysis.”

Figure 3

Search results interface on VOSviewer_1.6.19 software



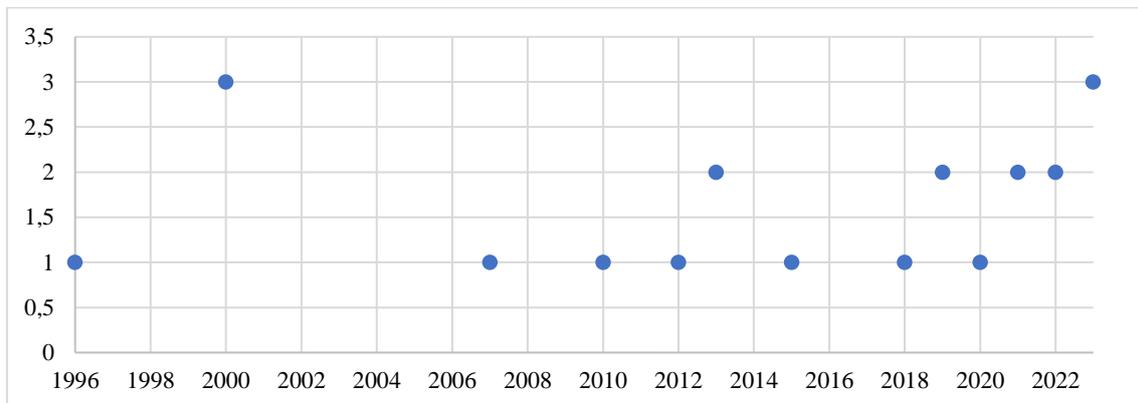
Verify retrieved documents

21 documents have been retrieved.

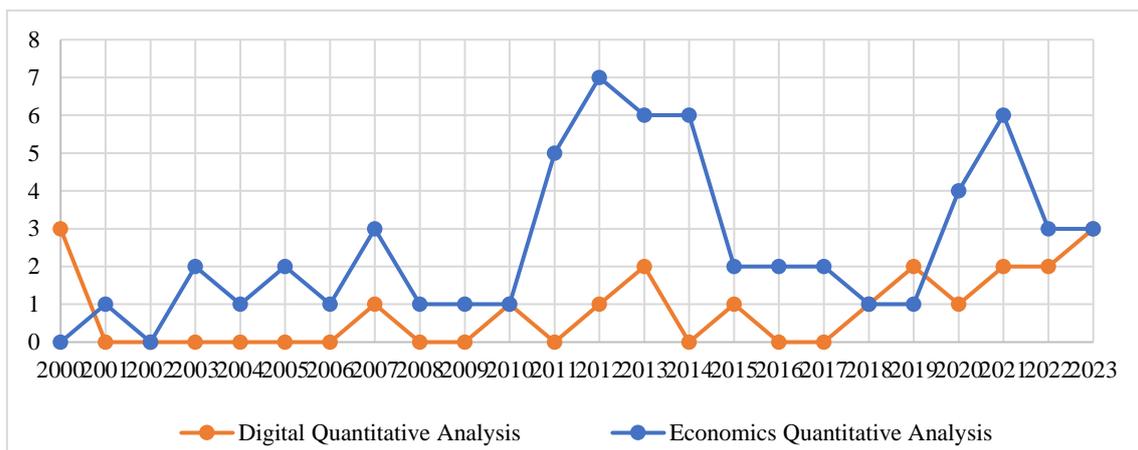
Selected	Authors	Title	Source	Year
<input checked="" type="checkbox"/>	Hanya Mahmood; Adam Shephar...	Development and validation of a m...	[no source]	2023
<input checked="" type="checkbox"/>	Maria Melchior; Marie Van Eycken; ...	POS1424 AQUAPORIN EXPRESSION...	[no source]	2023
<input checked="" type="checkbox"/>	Bin Chen; Juan Tao; Tong Wu; Hao ...	Correlation between 18F-FDG PET-...	[no source]	2023
<input checked="" type="checkbox"/>	Claudia Campana; Peter M. van Ko...	Digital quantification of somatosta...	[no source]	2022
<input checked="" type="checkbox"/>	Nuha Mohamed Gaafar; Tarig Al-H...	Epithelial PD-L1 expression at tum...	[no source]	2022
<input checked="" type="checkbox"/>	Nuha Mohamed Gaafar; Tarig Al-H...	Characterization of immune cell inf...	[no source]	2021
<input checked="" type="checkbox"/>	Dongsheng Xu; Lei Xianghui; Yang ...	A Novel Characterization Method o...	[no source]	2021
<input checked="" type="checkbox"/>	Yoshiyuki Akiyama; Daichi Maeda; ...	MP07-08 ARE GLOMERULATIONS S...	[no source]	2020
<input checked="" type="checkbox"/>	Yoshiyuki Akiyama; Daichi Maeda; ...	Molecular Taxonomy of Interstitial ...	[no source]	2019
<input checked="" type="checkbox"/>	Alan J. Wein	Re: Digital Quantitative Analysis of ...	[no source]	2019
<input checked="" type="checkbox"/>	Matthew Alleyne Dodd	The Empire of the Old Bailey Onlin...	[no source]	2018
<input checked="" type="checkbox"/>	J Chen	Syndrome Differentiation Algorith...	[no source]	2015
<input checked="" type="checkbox"/>	Lin Zhi-jia	Analysis of quail tongue manifestat...	[no source]	2013
<input checked="" type="checkbox"/>	Ying Sun; Cuiying Wang; Min Li; Yi...	ASSA13-03-11 Both Atorvastatin an...	[no source]	2013
<input checked="" type="checkbox"/>	Francesca Cordero; Marco Beccuti; ...	Optimizing a Massive Parallel Sequ...	[no source]	2012
<input checked="" type="checkbox"/>	Cui Wang	Effects of Fenofibrate on CXCL16 E...	[no source]	2010
<input checked="" type="checkbox"/>	Gerald James Bakeine; Alessia Berto...	Surface properties and implantatio...	[no source]	2007
<input checked="" type="checkbox"/>	Kenjiro Nakamura; T. Morisaki; Hir...	Morphometric analysis of regional ...	[no source]	2000
<input checked="" type="checkbox"/>	Ralph Pecker; Lennart Enerbäck; M...	RECRUITMENT DISTRIBUTION AND...	[no source]	2000

< Back Next > Finish Cancel

Source: Author analysis from VOSviewer_1.6.19 software

Figure 4*Number of publications by year (Digital et al.)*

Source: Author statistics from VOSviewer_1.6.19 software

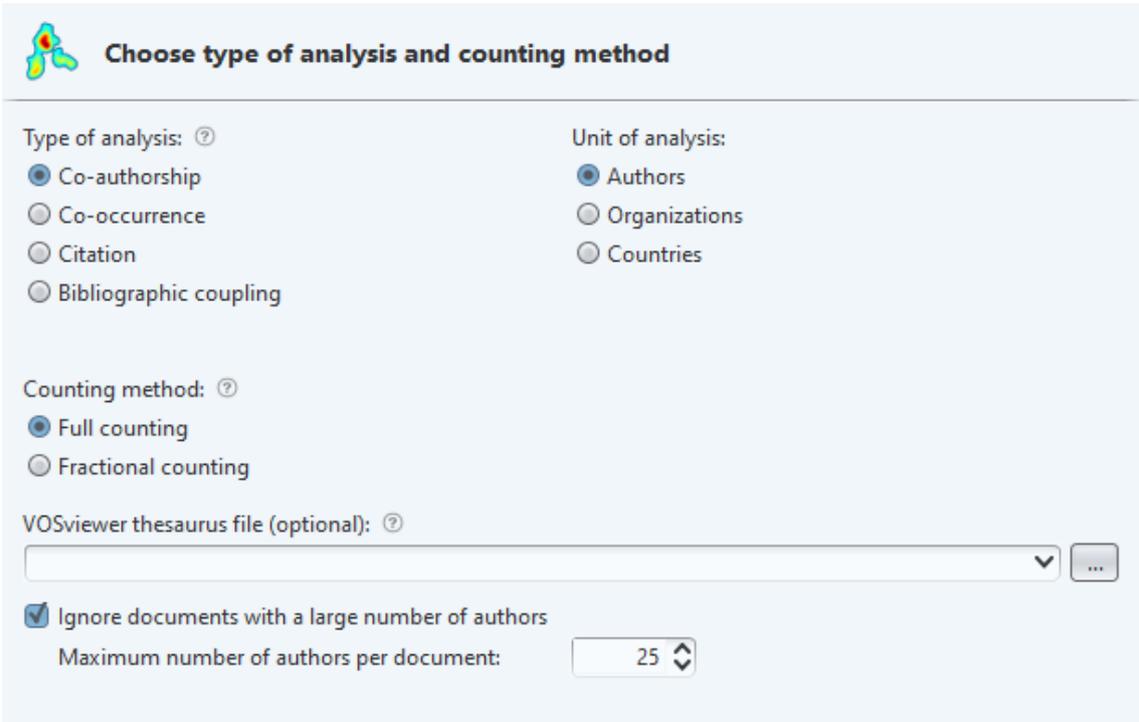
Figure 5*Number of publications by year (Digital et al. Analysis)*

Source: Author statistics from VOSviewer_1.6.19 software

3.2 Co-authorship analysis

Consider the connection between two authors (institution, country) determined when at least one concurrent citation exists in a document.

The co-authorship analysis interface is shown in Figure 6. The author, organization (school), or country can select filter methods.

Figure 6*Filter mode selection interface on VOSviewer_1.6.19 software*


The screenshot shows the 'Choose type of analysis and counting method' dialog box in VOSviewer_1.6.19. The interface is light blue and contains the following options:

- Type of analysis:**
 - Co-authorship
 - Co-occurrence
 - Citation
 - Bibliographic coupling
- Unit of analysis:**
 - Authors
 - Organizations
 - Countries
- Counting method:**
 - Full counting
 - Fractional counting
- VOSviewer thesaurus file (optional):** A dropdown menu with a search icon and a file selection button.
- Ignore documents with a large number of authors
 - Maximum number of authors per document:

Source: Author analysis from VOSviewer_1.6.19 software

The filtering results of co-author analysis in terms of the unit "author" are shown in Figures 7 and 8.

Figure 7 filters out nine authors with the highest number of articles and citations for the "Digital Quantitative Analysis" keyword. Figure 8 shows a graph of the relationship between these authors over time, specifically the five most cited authors, from 2019 to 2020.

Figure 7

Co-authorship by Authors filter results interface (number of documents ≥ 2 , number of citations > 10)

Verify selected authors				
Selected	Author	Documents	Citations	Total link strength 
<input checked="" type="checkbox"/>	daichi maeda	2	40	8
<input checked="" type="checkbox"/>	haruki kume	2	40	8
<input checked="" type="checkbox"/>	hiroto katoh	2	40	8
<input checked="" type="checkbox"/>	yoshiyuki akiyama	2	40	8
<input checked="" type="checkbox"/>	yukio homma	2	40	8
<input checked="" type="checkbox"/>	hirokazu noshiro	2	13	6
<input checked="" type="checkbox"/>	kenjiro nakamura	2	13	6
<input checked="" type="checkbox"/>	masao tanaka	2	13	6
<input checked="" type="checkbox"/>	naoko kinukawa	2	13	6

Source: Author analysis from VOSviewer_1.6.19 software

Figure 8

Graphical interface for filtering results of Co-authorship by Authors (number of documents ≥ 2 , number of citations > 10)



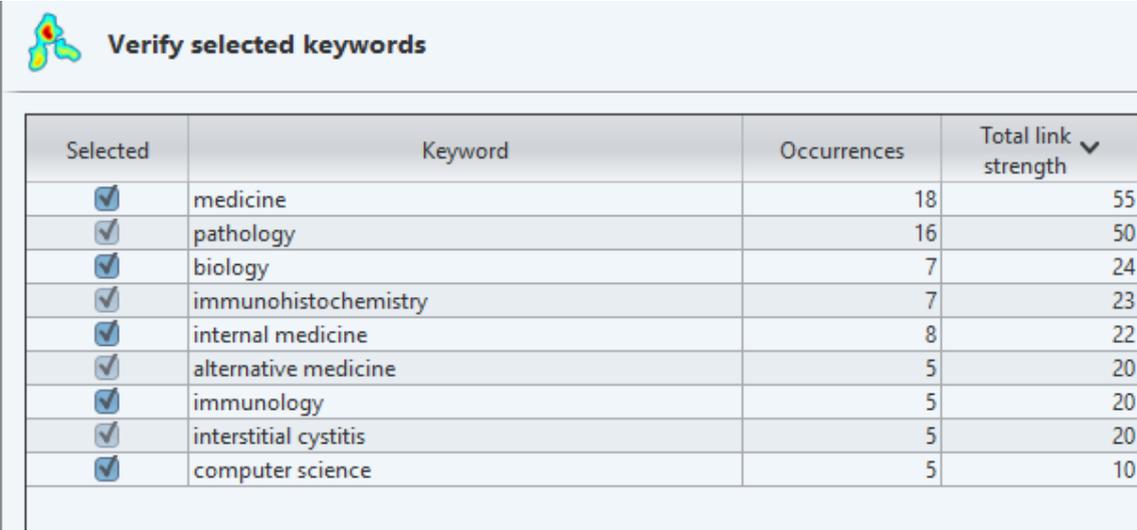
Source: Author analysis from VOSviewer_1.6.19 software

3.3 Co-keyword analysis: Terms that appear most often in research

Similarly, filter the search by co-occurrence by concepts (keyword = 5), as shown in Figure 9. With the nine most appearing keywords, statistics indicate the field of these studies, for example, medical field health (medicine, pathology, and internal medicine), biochemical field (biology, immunohistochemistry). Graph Figure 10 adds information about the level of association through the size of the circle and the publication time of the study by color.

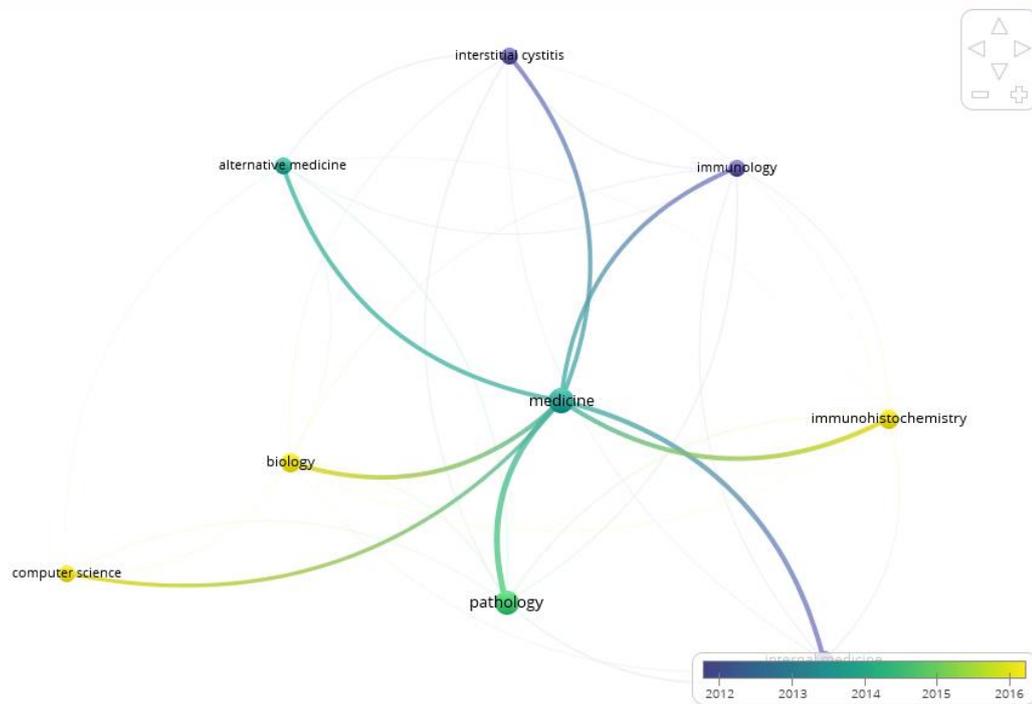
Figure 9

Co-occurrences by Concepts filter results interface (n = 9)



Selected	Keyword	Occurrences	Total link strength
<input checked="" type="checkbox"/>	medicine	18	55
<input checked="" type="checkbox"/>	pathology	16	50
<input checked="" type="checkbox"/>	biology	7	24
<input checked="" type="checkbox"/>	immunohistochemistry	7	23
<input checked="" type="checkbox"/>	internal medicine	8	22
<input checked="" type="checkbox"/>	alternative medicine	5	20
<input checked="" type="checkbox"/>	immunology	5	20
<input checked="" type="checkbox"/>	interstitial cystitis	5	20
<input checked="" type="checkbox"/>	computer science	5	10

Source: Author analysis from VOSviewer_1.6.19 software

Figure 10*Graphical interface for Co-occurrences by Concepts filtering results*

Source: Author analysis from VOSviewer_1.6.19 software

3.4 Co-citation analysis

This analysis will provide information about the most cited documents, the Author with the highest number of articles and citations, The university with the highest number of articles and citations, and the Country with the highest number of articles and citations.

3.4.1 Most cited documents

Figure 11 shows the most cited documents (10 publications), including several citations and year of publication. Figure 12 shows the citation level (by circle size) and the publication year (by color). The article's information is also fully displayed, including author, year of publication, title, publisher, etc.

Figure 11

Interface to filter most cited documents (n = 10)

 **Verify selected documents**

Selected	Document	Citations	Links
<input checked="" type="checkbox"/>	ralph peeker (2000)	133	0
<input checked="" type="checkbox"/>	paul a. dundore (1996)	47	0
<input checked="" type="checkbox"/>	yoshiyuki akiyama (2019)	40	0
<input checked="" type="checkbox"/>	francesca cordero (2012)	33	0
<input checked="" type="checkbox"/>	gerald james bakeine (2007)	15	0
<input checked="" type="checkbox"/>	kenjiro nakamura (2000)	13	0
<input checked="" type="checkbox"/>	claudia campana (2022)	4	0
<input checked="" type="checkbox"/>	nuha mohamed gaafar (2021)	3	1
<input checked="" type="checkbox"/>	nuha mohamed gaafar (2022)	1	1
<input checked="" type="checkbox"/>	hanya mahmood (2023)	1	0

Source: Author analysis from VOSviewer_1.6.19 software

Figure 12

Graph of most cited documents



Source: Author analysis from VOSviewer_1.6.19 software

3.4.2 Most cited authors

The filtering results show the 12 most cited authors on the research issue (Figure 13). With the keyword "Digital Quantitive Analysis," studies that satisfy the most mentioned conditions only stop at one publication.

Figure 13

Most cited authors filtering interface (n = 12)



Selected	Author	Documents	Citations ▼	Total link strength
<input checked="" type="checkbox"/>	frank aldenborg	1	133	0
<input checked="" type="checkbox"/>	lennart enerbäck	1	133	0
<input checked="" type="checkbox"/>	magnus fall	1	133	0
<input checked="" type="checkbox"/>	ralph peeker	1	133	0
<input checked="" type="checkbox"/>	arnold m. schwartz	1	47	0
<input checked="" type="checkbox"/>	h. semerjian	1	47	0
<input checked="" type="checkbox"/>	paul a. dundore	1	47	0
<input checked="" type="checkbox"/>	francesca cordero	1	33	0
<input checked="" type="checkbox"/>	maddalena arigoni	1	33	0
<input checked="" type="checkbox"/>	marco beccuti	1	33	0
<input checked="" type="checkbox"/>	raffaele calogero	1	33	0
<input checked="" type="checkbox"/>	susanna donatelli	1	33	0

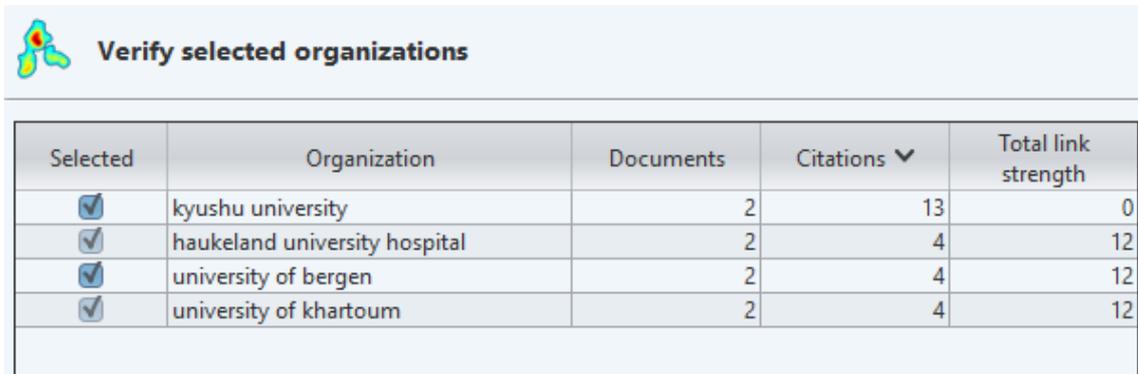
Source: Author analysis from VOSviewer_1.6.19 software

3.4.3 An organization with the most cited articles

Figure 14 shows that the organization with the highest number of publications (2) and the most citations (≥ 4) consists of 4 units.

Figure 14

Filtering interface for organizations with the most cited articles (n = 4)



Selected	Organization	Documents	Citations ▼	Total link strength
<input checked="" type="checkbox"/>	kyushu university	2	13	0
<input checked="" type="checkbox"/>	haukeland university hospital	2	4	12
<input checked="" type="checkbox"/>	university of bergen	2	4	12
<input checked="" type="checkbox"/>	university of khartoum	2	4	12

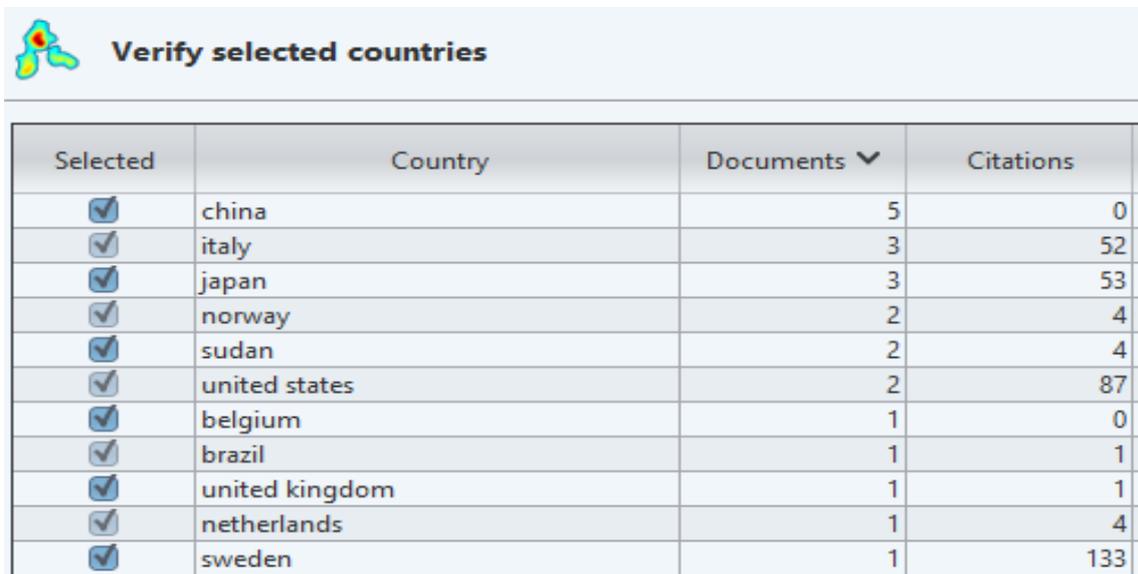
Source: Author analysis from VOSviewer_1.6.19 software

3.4.4 A country with the most cited articles

Figure 15 is the filtering result of 10 countries with the highest number of publications and highest citations.

Figure 15

Filtering interface for organizations with the most cited articles (n = 10)



Selected	Country	Documents ▼	Citations
<input checked="" type="checkbox"/>	china	5	0
<input checked="" type="checkbox"/>	italy	3	52
<input checked="" type="checkbox"/>	japan	3	53
<input checked="" type="checkbox"/>	norway	2	4
<input checked="" type="checkbox"/>	sudan	2	4
<input checked="" type="checkbox"/>	united states	2	87
<input checked="" type="checkbox"/>	belgium	1	0
<input checked="" type="checkbox"/>	brazil	1	1
<input checked="" type="checkbox"/>	united kingdom	1	1
<input checked="" type="checkbox"/>	netherlands	1	4
<input checked="" type="checkbox"/>	sweden	1	133

Source: Author analysis from VOSviewer_1.6.19 software

4 CONCLUSION AND DISCUSSION

The research results have introduced VOSviewer software, which collects general documents by specific keywords. Bibliometric analysis has become an essential tool for

evaluating and analyzing researchers' publications (Ellegaard & Wallin, 2015), scientific research collaborations between institutions (Skute et al., 2019), the impact of national science investments (Fabregat-Aibar et al., 2019). With the available and accessible OpenAlex database right in this software, there are outstanding advantages for researchers to use.

VOSviewer software used for research overview is very suitable for the following reasons:

Firstly, content collected from VOSviewer software can help collect diverse information: 1) Analyze the publication volume of related research by keywords; 2) Co-authorship analysis; 3) Analyze keyword co-occurrence; 4) Analyze co-citations of keywords, authors, and documents (co-citation).

Second, the information collected will reveal the history of the research problem, the peak time, and the trend of the research problem. This information will help researchers analyze and point out gaps or decide whether to continue research. This information will help researchers reduce time and effort in searching for information.

Third, analytical information can be obtained according to author, university, and country criteria. According to this analysis, researchers can get information about the most influential scholars through the most articles and citations, universities (institutions), and countries with the most publications and citations. With this information, researchers can know what documents to read, such as classic documents, to avoid confusion and ambiguity in large databases.

Fourth, through co-authorship analysis, information can be collected about the collaboration of authors in research. In addition to showing the connection, this software also measures the strength of the link by indicating the thickness or size of the map. At the same time, in this way, analyzing co-authorship based on organizations and countries can show a picture of the cooperation and the level of investment in scientific research of different organizations and governments in research in a particular field.

This study introduces the OpenAlex database source, which is convenient to access and use. However, researchers can use other reputable alternative data sources such as Scopus or Google Scholar as a suggestion for further research.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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