MAPPING OF PEGASUS SPYWARE OUTPUT AT GLOBAL LEVEL: A SCIENTOMETRIC STUDY

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ABSTRACT:

The present study is to analysis mapping of Pegasus spyware output at global level a scientometric study using web of science during the years 2018 to 2022. The present study is to analyses scientometric measurements for that a total of articles 1539 were downloaded from web of science.Examinethe. Annual Scientific Production, to find out the Average Citation perYear, Most Relevant Sources, to find out the Country Scientific Production. The most productive year period were 2021 was found to have a majority of 348 (22.61 %) contributions out of a total of 1539 contributions 2019 (307) (19.95%), 2020 (305) (19.82 %), 2022 (293) (19.04%), 2018 (286) (18.58%) had minimal contributions. The most relevant sources was Scientific Reports (22), followed by Monthly Notices Of The Royal Astronomical Society (20), Science Of The Total Environment (16), Astronomy & Astrophysics (14), Criminal Justice And Behavior (12). Observed that the most productive top countries, USA has produced highest 2637 (35.24%) papers followed by UK 529 (7.07 %), Germany 505 (6.75 %), Belgium 364 (4.48 %), France 296 (3.96 %) respectively these countries are included. Scholarly qualities of the source journal (Table 1). As in 2018-2022, sources (Journals, Book) (976), documents (1539), authors (6557), Document Average Age (2.96), average citations per documents (13.32), references (65497), Author (6557), authors of single-authored documents (73), Single-authored docs (85)Co-Authors per Doc(7.07), International co-authorships (40.68), proceedings paper (121) were seen throughout the years.

KEYWORDS:

Mapping, Pegasus Spyware, Web of science Biblioshiny -R-studio, Scientometrics

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INTRODUCTION:

Pegasusis a Peta –scale graph mining system on Hadoop, fully written in Java. It computes the degree distribution PageRank, RWR (Random Walk with Restart) scores, radii/diameter, and connected components of very large graphs with more than billions of nodes and edges. Pegasus is a highly sophisticated and controversial spyware developed by the Israeli cybersecurity firm NSO Group. It gained significant attention due to its capabilities, which allow it to infiltrate and monitor mobile devices, including smartphones. Recent revelations on the deployment of Pegasus spyware, including in a number of Council of Europe states targeting journalists, human rights defenders and politicians have raised a significant public outcry. Usage of such an intrusive technology not only adversary affects the effective enjoyment of the right to privacy and freedom of expression but also the notion of personal autonomy and even the physical integrity of individuals.Pegasus is designed for targeted surveillance, primarily against individuals of interest. It's often used by governments and law enforcement agencies to monitor the activities of specific individuals, including activists, journalists, and dissidents. However, there have been instances of misuse and abuse, raising concerns about privacy and human rights. Capabilities:

Remote Access: Pegasus allows remote access to the infected device, giving the attacker extensive control over its functions. Stealth Mode: It operates in stealth mode, making it challenging for users to detect its presence on their devices. Data Extraction: Pegasus can extract a wide range of data, including call records, messages, emails, passwords, and more. Real-time Monitoring: The spyware enables real-time monitoring of phone calls, messages, emails, and other communication channels. Exploits Vulnerabilities: Pegasus often takes advantage of software vulnerabilities in popular mobile operating systems, such as IOS and Android, to infiltrate devices.

Controversies:

Abuse: Pegasus has been linked to cases where it was misused to target political dissidents, journalists, and human rights activists. Ethical Concerns: The use of Pegasus has raised ethical concerns regarding user privacy, freedom of the press, and human rights. Legal Actions: NSO Group has faced legal challenges and criticism for the misuse of its spyware, leading to debates on the regulation of surveillance technologies. Notable Incidents: Pegasus has been implicated in several high-profile incidents globally. For example, it was allegedly used to target journalists, politicians, and activists in various countries.

Countermeasures: Given the advanced nature of Pegasus, protecting against it requires a combination of security measures, including regular software updates, security patches, and awareness of phishing attempts.

Scientometrics is the science of method scientific output similar to bibliometric used by librarians and information scientist. (Agrawal, arena, 1982). To identify national an international network and to map the development of new fields of science and technology as well as to know the inner logic of science development. (YadavJanise Ram, 1984); one significant finding in the field is principle of cost escalation to the effect that achieving further findings at a given level of importance grow exponentially more costly in the expenditure of efforts and resources. It involves quantitative studies of scientific activities, including, among others, publication, and so overlaps bibliometrics to some extent. (Tague Sutcliffe, 1992).

REVIEW OF LITERATURE:

Tayade Suraj M and Khaparde V.S (2023) The present study attempts to measure the annual scientific publication growth, to examine the average citation, to identify most relevant sources, to identify most local cited sources (from reference lists), to identify the most relevant author, to measure country wise distribution of articles, to identify most cited countries India is 3th Rank , to identify most global cited documents, and to measure collaboration network country, attached to the articles. The most productive year period were 2018, a total (of 471) articles were published and the 2012 (16), 2013 (34), 2014 (56) are the lowest or no articles, total (1721) authors from 53 countries have contributed to the publication of articles. A complete of 1716 articles was contributed by multi-authored and 47 articles contributed by single authored.

Khandare Jayshila K. and Khaparde V.S. (2015) paper deals with scientometric analysis of the new library world. The study cover bibliographical distribution of citations year wise, ranking of authorship pattern, observe average length of articles Geographical distribution of contributors of articles, subject trends of articles. 'The new library world' have 5 volumes, 39 issues of the New Library world during 2005-2009. Highest numbers of contributors are from USA with 104 articles with (46.22%) Single authors are predominant than collaborative author.

Gaikwad Deepa N. and Khaparde Vaishali .S. (2019) were studied in scientometric analysis on mapping of plagiarism research output in India. The Study analyzed the plagiarism research performance of India in national as well as global

Context, Focused on geographical distribution that the most of the publication are from USA with 19.32% the study explained that the solo Research is predominant than the collaborative research and the degree of collaboration is 0.87 also shows that the Relative growth rate [R (A) is (0.346) while the Doubling time DT (A) gradually increased from (1.548) that shows rate of publication was decreased, the Doubling time was increased.

Shilpa B. S (2019) Mapping of scientometric Articles on Leukemia: A Scientometric srudy. The study analyses the Leukemia research publications in India during 2009 to 2018 based on the Web of Science database. The main objective of the study is to analyze to ascertain the Sydenham chorea.

Santosh, D., **Vaishali, K. S.,**& (2020). Mapping of world publications: Sydenham chorea disease. The paper focuses on Mapping of World Publications: Sydenham Chorea Disease. Which has given on PubMed database for during the year 2000 to 2018? There are total 9799 documents on Sydenham Chorea Disease.

Bhagat, M.P. & khaparde, V. (2019) study of Scientometric analysis of 214 research articles covered during the periods of 2011-2015 in SCOPUS Database. This study reviewed the length of title, numbers of pages, type of document, chronological distribution of articles.

Khaparde V.S and Pawar S (2013) studied the authorship pattern and author's collaborative research in Information Technology with a sample of 17,917 articles collected from LISA during 2000-–2009.

WEB OF SCIENCE:

The web of science (WoS, previously known as web of Knowledge) is a website that provides subscription based access to multiple databases that provide comprehensive citation data for many different academic discipline. It was originally produced by the institute for scientific Information.

SCOPE AND LIMITATION OF THE STUDY:

The research publications on the Mapping of Pegasus Spyware Output at Global level between 2018 and 2022 were retrieved from the web of science database. The keyword "Pegasus Spyware" was used in the subject area and the top researchers with the most publications were searched. A total of 1539publications have been downloaded by web of science advanced search builder.

METHODOLOGY:

The research publications were retrieved from the Web of Science core collections Database on the topic, the Mapping of Pegasus Spyware Output at Global level which is scattered over the period from 2018 to 2022. The search was carried out using the key word Pegasus spyware ' in the, topic field. A total of 1539 publications were downloaded and the same was analyzed using the analyzed using Biblioshiny software, Microsoft Excel as per the objectives of the study.

OBJECTIVES:

1. To examine the Main information about data
2. To find out the Annual Scientific Production
3. To find out the Average Citation Per Year
4. To find out the Most Relevant Authors
5. To find out the Most Relevant Sources
6. To find out the Country Scientific Production.

DATA ANALYSIS AND INTERPRETATION:

There is observed from the analysis of the collected data has yielded many interesting findings that reflect the scholarly qualities of the source journal (Table 1). As in 2018-2022, sources (Journals, Book) (976), documents (1539), authors (6557), Document Average Age (2.96), average citations per documents (13.32), references (65497), Author (6557), authors of single-authored documents (73),Single-authored docs (85)Co-Authors per Doc (7.07) , International co-authorships (40.68), proceedings paper (121)were seen throughout the years.

Table No. 1MAIN INFORMATION ABOUT DATA

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2018:2022
Sources (Journals, Books, etc)	976
Documents	1539
Annual Growth Rate %	0.61
Document Average Age	2.96
Average citations per doc	13.32
References	65497
DOCUMENT CONTENTS	
Keywords Plus (ID)	4867
Author's Keywords (DE)	4529

AUTHORS	
Authors	6557
Authors of single-authored docs	73
AUTHORS COLLABORATION	
Single-authored docs	85
Co-Authors per Doc	7.07
International co-authorships %	40.68
DOCUMENT TYPES	
Article	1196
proceedings paper	121
Review	77
meeting abstract	66
editorial material	23
article; proceedings paper	16
article; early access	8
Correction	8
Letter	7
Poetry	5
article; book chapter	4
book review	4
news item	2
art exhibit review	1
letter; early access	1
TOTAL NO. OF DOCUMENT TYPES	1539

Figure No. 1 DOCUMENT TYPES

This can be seen from 2021 was found to have a majority of 348 (22.61 %) contributions out of a total of 1539 contributions 2019 (307) (19.95%), 2020 (305) (19.82 %), 2022 (293) (19.04), 2018 (286) (18.58) had minimal contributions (Table 2 and Figure 2).

Table No. 2Annual Scientific Production

Annual Scientific Production			
Sr. No.	**Year**	**Articles**	**%**
1	2018	286	18.58
2	2019	307	19.95
3	2020	305	19.82
4	2021	348	22.61
5	2022	293	19.04

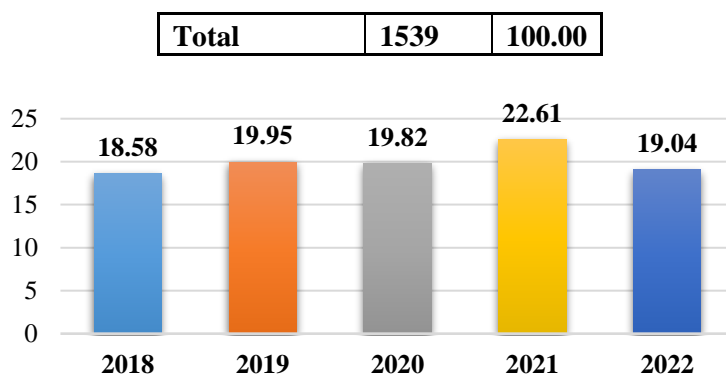| Total	1539	100.00

Table 3 and Figure 3 have been observed Annual scientific growth of publications in the source journal during the period 2018 to 2022. Total 1539 articles have been published; it is observed a significant growth in the number of articles (348) which is highest as compared to the articles published during 2021. The mean total citation per art (16.44) highest in the year 2020 and The Mean TC per Year (5.58) highest in the year 2020.

Table No. 3 Average Citation per Year

Average Citation Per Year				
Year	No. of Articles	Mean TC per Art	Mean TC per Year	Citable Years
2018	286	22.33	4.47	5
2019	307	15.34	3.83	4
2020	305	16.44	5.48	3
2021	348	9.17	4.59	2
2022	293	4.08	4.08	1
Total	**1539**	**67.36**	**22.45**	**15**

Figure No. 3Average Citation per Year

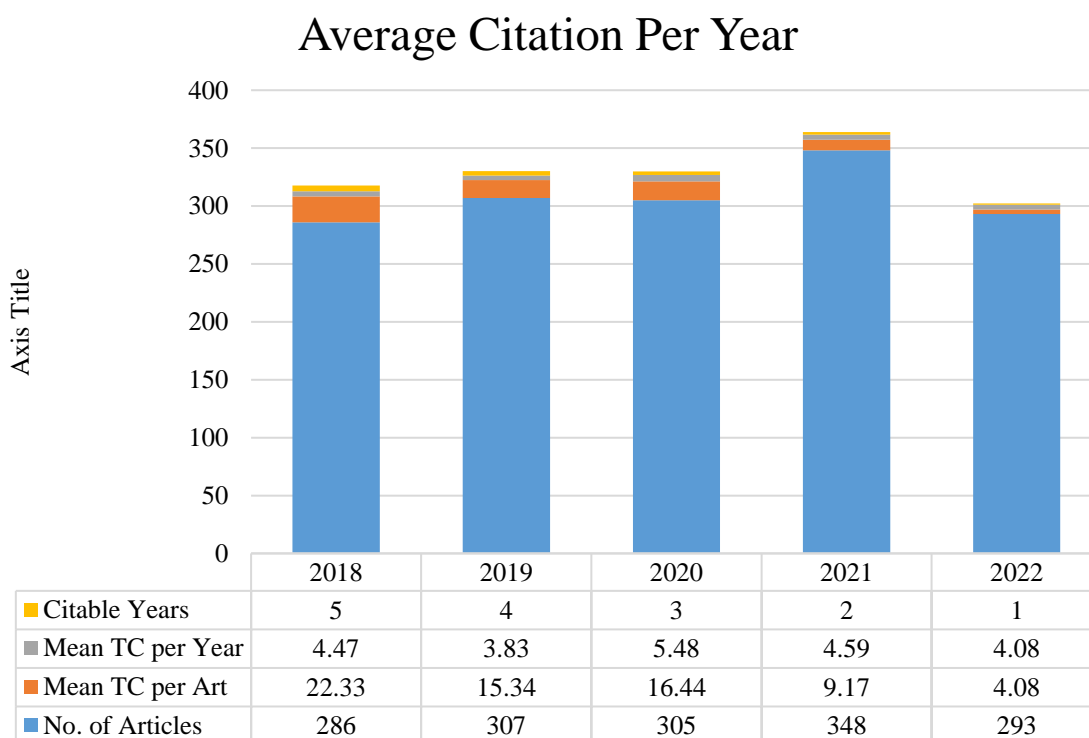|	2018	2019	2020	2021	2022
Citable Years	5	4	3	2	1
Mean TC per Year	4.47	3.83	5.48	4.59	4.08
Mean TC per Art	22.33	15.34	16.44	9.17	4.08
No. of Articles	286	307	305	348	293

Table 4 and Figure 4 show the most relevant authors in the source journal during the analyzed period. The most relevant authors was NAVARRO-MATEU F 29 (1.25 %), followed by KESSLER RC 27 (1.05 %), ALONSO J 26 (1.02 %).

Table No. 4

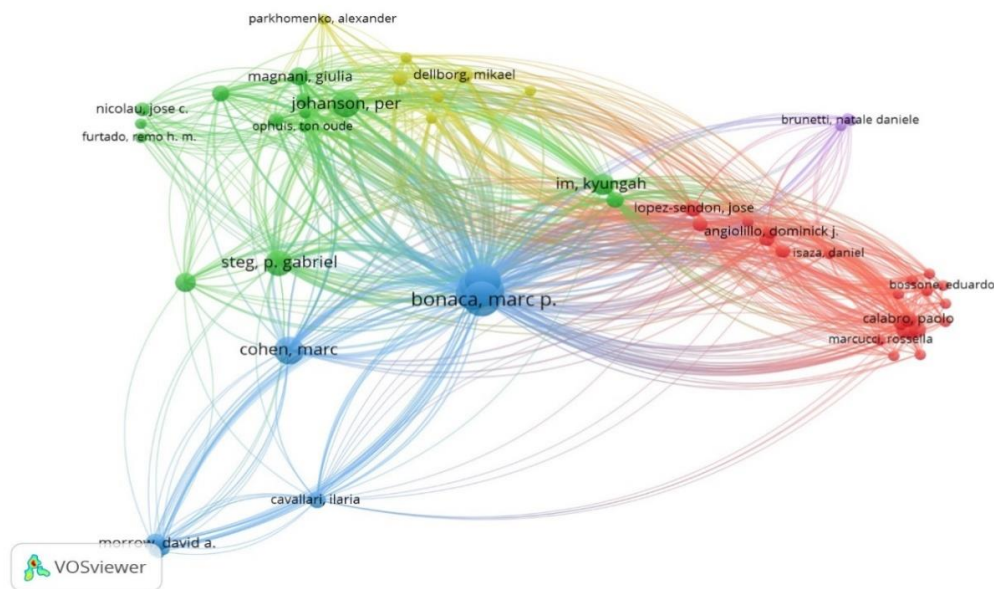| Most Relevant Authors			
Sr. No.	**Authors**	**Articles**	**Articles Fractionalized**
1	NAVARRO-MATEU F	29	1.25
2	KESSLER RC	27	1.05
3	ALONSO J	26	1.02
4	HERTL M	25	5.01
5	JENA HS	23	3.4
6	KARAM EG	23	0.75
7	LEE S	23	1.05
8	GUREJE O	22	0.7
9	BONACA MP	20	1.5
10	THIELENS A	20	2.83
11	DEELMAN E	19	2.57
12	BHATT DL	18	1.27
13	DE GIROLAMO G	18	0.53
14	FLORESCU S	18	0.58
15	HARO JM	18	0.55
16	POSADA-VILLA J	18	0.56
17	SABATINE MS	18	1.32
18	STEG PG	18	1.34
19	STOREY RF	18	1.31
20	VAN DER VOORT P	18	2.64

Table 5 and Figure 5shows the top twenty authors who wrote at least articles in the source journal during the analyzed period. The most relevant sources was Scientific Reports(22), followed byMonthly Notices Of The Royal Astronomical Society(20), Science Of The Total Environment (16), Astronomy & Astrophysics (14), Criminal Justice And Behavior (12).

Table No. 5Most Relevant Sources

Most Relevant Sources			
Sr. No.	**Sources**	**Articles**	**%**
1	Scientific Reports	22	1.43
2	Monthly Notices Of The Royal Astronomical Society	20	1.30
3	Science Of The Total Environment	16	1.04
4	Astronomy & Astrophysics	14	0.91

| 5	Criminal Justice And Behavior	12	0.78
6	Astrophysical Journal	11	0.71
7	Frontiers In Immunology	11	0.71
8	Nature Communications	10	0.65
9	Abstracts Of Papers Of The American Chemical Society	8	0.52
10	British Journal Of Haematology	8	0.52
11	Circulation	8	0.52
12	Future Generation Computer Systems-The International Journal Of Escience	8	0.52
13	Physical Review D	8	0.52
14	Ieee Access	7	0.45
15	Journal Of The American Heart Association	7	0.45
16	Psychological Medicine	7	0.45
17	American Journal Of Criminal Justice	6	0.39
18	American Journal Of Mens Health	6	0.39
19	Applied Sciences-Basel	6	0.39
20	Crime & Delinquency	6	0.39
21	European Heart Journal	6	0.39
22	Ieee Transactions On Plasma Science	6	0.39
23	Journal Of Transportation Engineering Part A-Systems	6	0.39
24	New Zealand Medical Journal	6	0.39
25	Plos One	6	0.39
26	5 Sources are relevant 10 times	50	3.25
27	4 Sources are relevant 25 times	100	6.50
28	3 Sources are relevant 46 times	138	8.97
29	2 Sources are relevant 150 times	300	19.49
30	1 Source are relevant 720 times	720	46.78
Total		**1539**	**100.00**

%
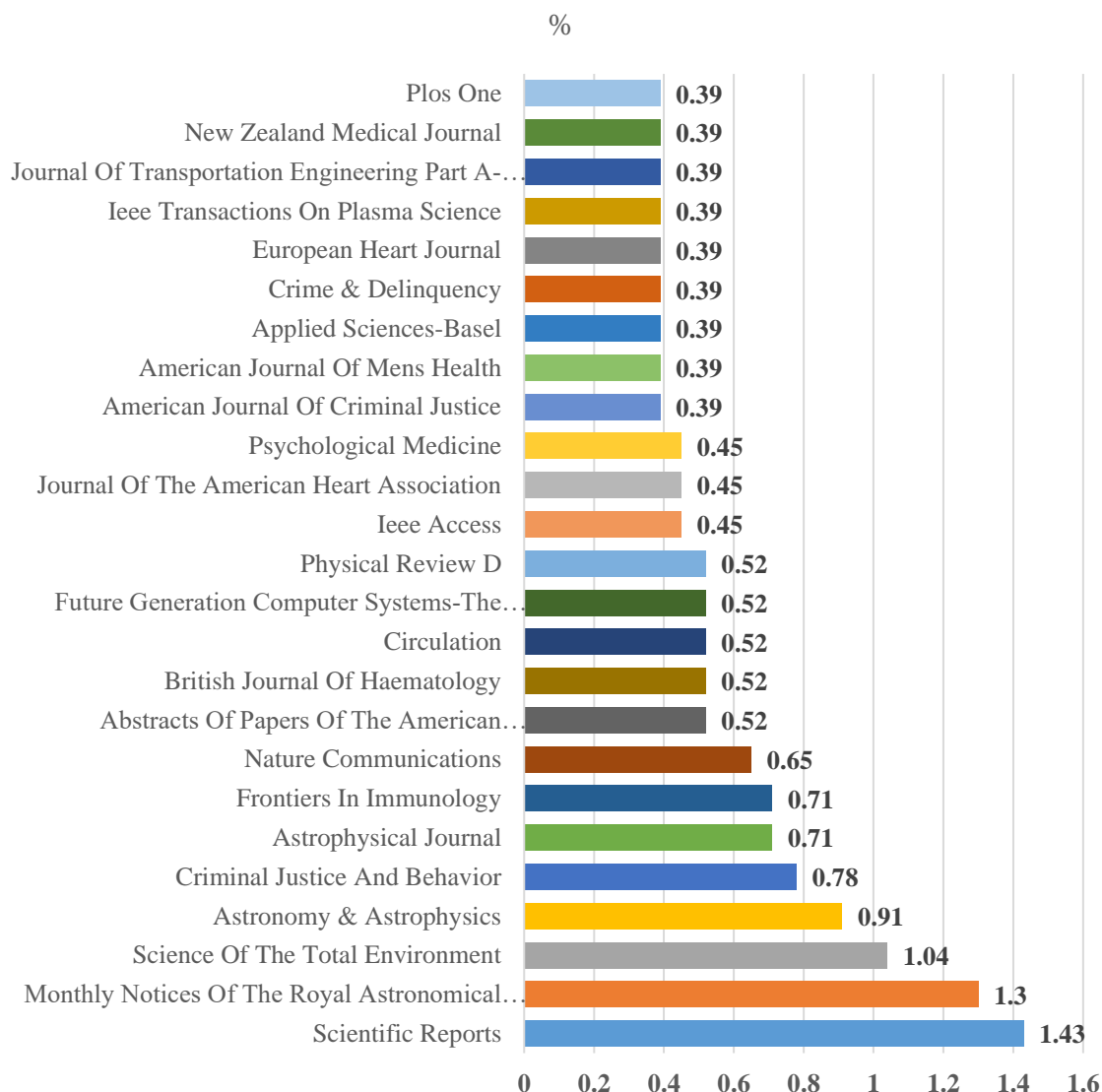
Table 6 and Figure 6 observed that the most productive top countries by numbers of papers USA has produced highest with its total global citation score 2637 (35.24%) papers followed by UK 529 (7.07 %), Germany 505 (6.75 %), Belgium 364 (4.48 %), France 296 (3.96 %) respectively these countries are included. It could be identified that the country wise analysis the following countries USA, UK, Germany, Belgium, France, Spain, Canada, China , Italy identify the most productive counter based on the number of research paper published.

Table No. 6Country Scientific Production

Country Scientific Production			
Sr. No.	**Region**	**Frequency**	**%**
1	USA	2637	35.24
2	UK	529	7.07
3	Germany	505	6.75
4	Belgium	364	4.86
5	France	296	3.96
6	Spain	286	3.82
7	Canada	261	3.49
8	China	243	3.25
9	Italy	238	3.18
10	Australia	218	2.91
11	Netherlands	139	1.86
12	New Zealand	133	1.78

13	Japan	122	1.63
14	Portugal	96	1.28
15	South Korea	92	1.23
16	Brazil	85	1.14
17	Switzerland	85	1.14
18	India	81	1.08
19	Sweden	80	1.07
20	Poland	71	0.95
21	1 Country are relevant 68 times	68	0.91
22	1 Country are relevant 63 times	63	0.84
23	2 Country are relevant 46 times	92	1.23
24	1 Country are relevant 42 times	42	0.56
25	1 Country are relevant 41 times	41	0.55
26	1 Country are relevant 40 times	40	0.53
27	1 Country are relevant 38 times	38	0.51
28	1 Country are relevant 36 times	36	0.48
29	1 Country are relevant 35 times	35	0.47
30	1 Country are relevant 34 times	34	0.45
31	1 Country are relevant 33 times	33	0.44
32	2 Country are relevant 31 times	62	0.83
33	1 Country are relevant 29 times	29	0.39
34	1 Country are relevant 25 times	25	0.33
35	1 Country are relevant 24 times	24	0.32
36	3 Country are relevant 21 times	63	0.84
37	2 Country are relevant 19 times	38	0.51
38	1 Country are relevant 14 times	14	0.19
39	1 Country are relevant 12 times	12	0.16
40	1 Country are relevant 11 times	11	0.15
41	2 Country are relevant 10 times	20	0.27
42	1 Country are relevant 9 times	9	0.12
43	1 Country are relevant 8 times	8	0.11
44	1 Country are relevant 7 times	7	0.09
45	6 Country are relevant 3 times	18	0.24
46	1 Country are relevant 5 times	5	0.07
47	2 Country are relevant 4 times	8	0.11
48	5 Country are relevant 3 times	15	0.20
49	2 Country are relevant 8 times	16	0.21
50	1 Country are relevant 16 times	16	0.21
Total		**7483**	**100.00**

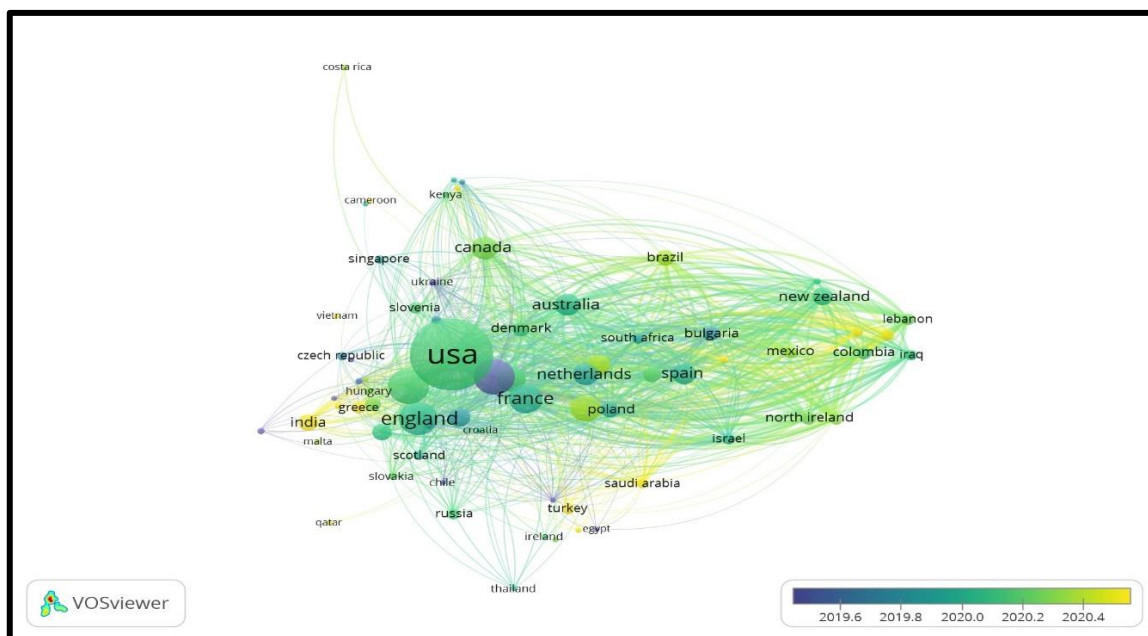Figure 6

Conclusion:

The number of papers published in "Pegasus Spyware" has gradually increased during2015-2019 and the study has shown that 3905 research documents have been published in Pegasus Spyware during the period. The most productive year period were 2021 was found to have a majority of 348 (22.61 %) contributions out of a total of 1539 contributions 2019 (307) (19.95%), 2020 (305) (19.82 %), 2022 (293) (19.04%), 2018 (286) (18.58%) had minimal contributions. The present study providing guidance to researchers in the field of Mapping of Pegasus Spywareto get information about trends in topic development, topics and sources to publish their research work to gain global recognition.

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