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# Bibliometric analysis of international publication trends on social media and terrorism by using the Scopus database

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Social Media and Terrorism are often studied together and have become the focus of many authors in recent years. Therefore, this study aims to evaluate international publication trends on social media and terrorism, using the Scopus database through bibliometric analysis from 2009 to 2022. Data visualization and analysis were conducted using Microsoft Excel and VOSviewer. The results showed that the international publications trend reached a peak in 2018, with 103 publications emphasizing various topics, such as social media, terrorism, Twitter, terrorist attacks, and several issues related to terrorist activities and digital platforms. The United States was also the most common country of publication with the highest number of affiliated authors. In addition, the authors with the most published documents were Tsikrika T. and Vrochidis S., with the majority of reports prioritizing social sciences. These results are expected to contribute to the novelty of previous studies on social media and terrorism.

## KEYWORDS

bibliometric, Scopus, social media, terrorism, trends

## Introduction

Social media and terrorism are recently the focus of study for authors in several countries (Mussiraliyeva et al., 2020). Besides being interconnected, these topics also emphasize the development of increasingly sophisticated information and communication technology in the modern and globalized era (Almoqbel and Xu, 2019). From this context, the globalization era is the starting point for significant changes in the life of traditional society, regarding the development of a modern community with sophisticated technology (Tantray and Vishwavidyalya, 2021). In modern society, technology is diverse and originates from various fields, such as the industrial (Groumpos, 2021) and transportation (Chami, 2021) sectors. This diverse element is found to be continuously developing in other fields, to improve human life (Shilling and Mellor, 2017). In this case, the development of information and communication technology is one field playing a significant role in the lives of people during the modern era (Kumari, 2019; Omotosho, 2019), facilitating efficient and fast communication and sharing of information (Bibi et al., 2017). It also leads to the establishment of social media platforms, which commonly provides a range of benefits and functions (Giri and Vats, 2019).

Social media is a platform with an internet network, which allows people to connect with others or groups, toward sharing information and communicating about specific topics (Kaati et al., 2016). This is a technology that allows several people to communicate, share information and opinions, as well as portray specific expressions through a globally interconnected community or network (Abbas et al., 2022). It is also a site for expressing various opinions regarding an event, information, product, etc. (Tran and Tran, 2018). These definitions highlight the diverse functions of social media (Xu et al., 2018), enabling people to stay connected despite the geographical distance (Royo-Vela and McBee, 2020). The technology is also capable of providing information about an event in a country, for the global awareness of other nations (Zhu et al., 2020). Therefore, social media prioritizes prompt, unlimited, as well as efficient communication and information sharing (Sanri and Goodwin, 2014).

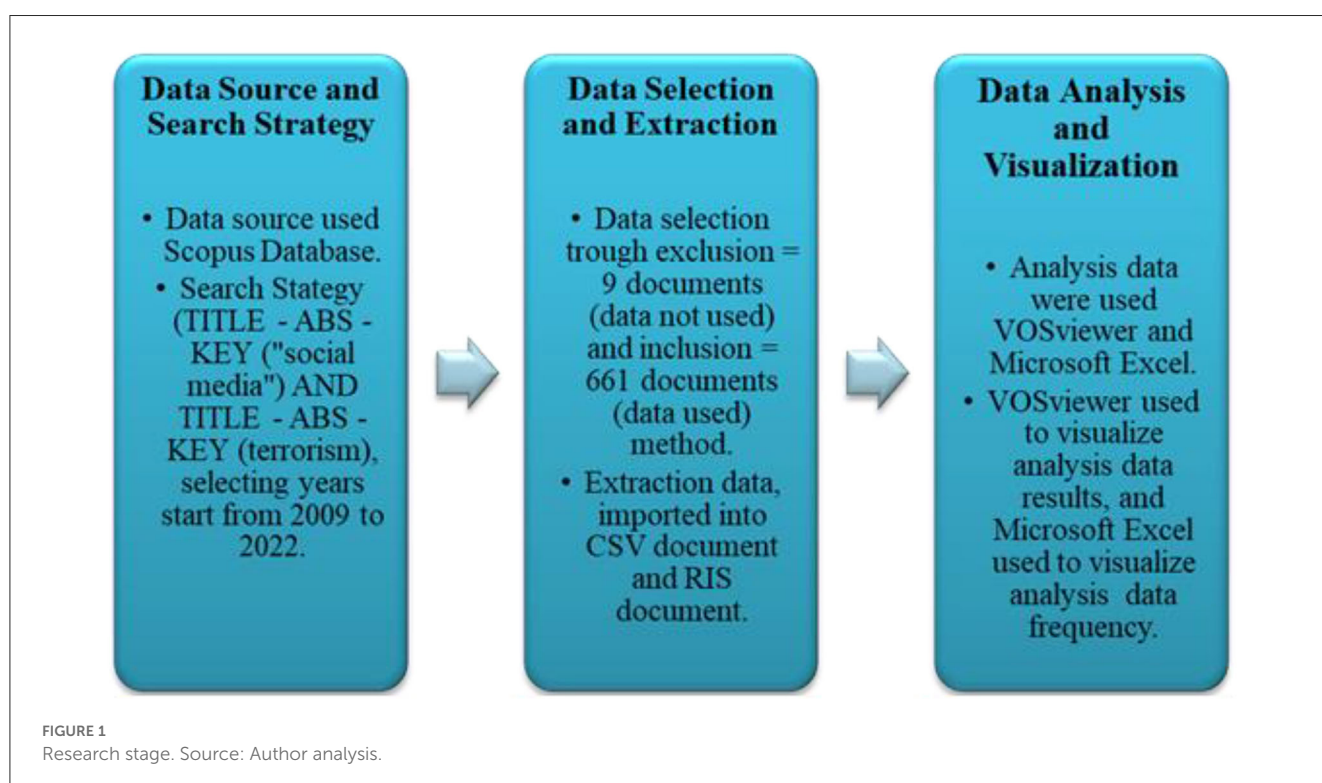
The negative impacts of social media are also emphasized regardless of the positive features exhibited (Caton and Landman, 2022). For instance, hoaxes, hate speech, fraud and crime have become the new methods of propaganda and recruiting potential terrorists (Smith et al., 2018; Jamil et al., 2022). According to the data from *The Ministry of Communication and Information of Indonesia* (2018), the government blocked 10,499 pieces of content containing radicalism and terrorism in the country. This included 7,160, 1,316, 677, 502, 502, and 292 pieces of content on Facebook/Instagram, Twitter, YouTube, Telegram, file-sharing platforms, and websites, respectively. From this context, social media is used to communicate and share unlimited information about specific topics (Gaikwad et al., 2022). This explains that the perpetrators of extremism often misuse the technology to spread radical ideologies (Mugari, 2020), leading to a concern for the global community. In this case, terrorism is observed as

an international threat negatively impacting foreign security and causing the destruction of life (Dwiwarno, 2018; Subagyo, 2021). Social media platforms such as Facebook and Twitter are also frequently implemented to quickly spread terrorism information (Tundis et al., 2019), leading to public awareness (Gialampoukidis et al., 2017a).

Based on several previous reports, a positive relationship was observed between social media usage and terrorism, specifically on Facebook, which was used for sharing extremism information (Asongu et al., 2019). The function of social media was also misused to spread radical ideology and other extreme content (Jain and Vaidya, 2021). Moreover, the technology development allowed Asia-Pacific extremist groups, such as Abu Sayyaf in the Philippines, to carry out propaganda, spread radical ideas, recruit members, and perform fundraising (Schreer and Tan, 2019). In some previous studies, various experimental emphases were prioritized, including the relationship between social media and terrorism and the function of the technological development for terrorist groups. However, a limited comprehensive understanding of social media and terrorism was observed, specifically its trends and scientific structures.

In an attempt to fill gaps in existing studies, this study aims to evaluate international publication trends on social media and terrorism, using the Scopus database through bibliometric analysis from 2009 to 2022. It aims to analyze the scientific production per year, the most author, affiliations, and countries contribution, research areas, funding information, and the theme cluster using co-occurrence. As a first step, the researchers created the following research questions (RQs);

RQ 1 What are the trends in international publications on the study of social media and terrorism?



## International Publication Documents by Year

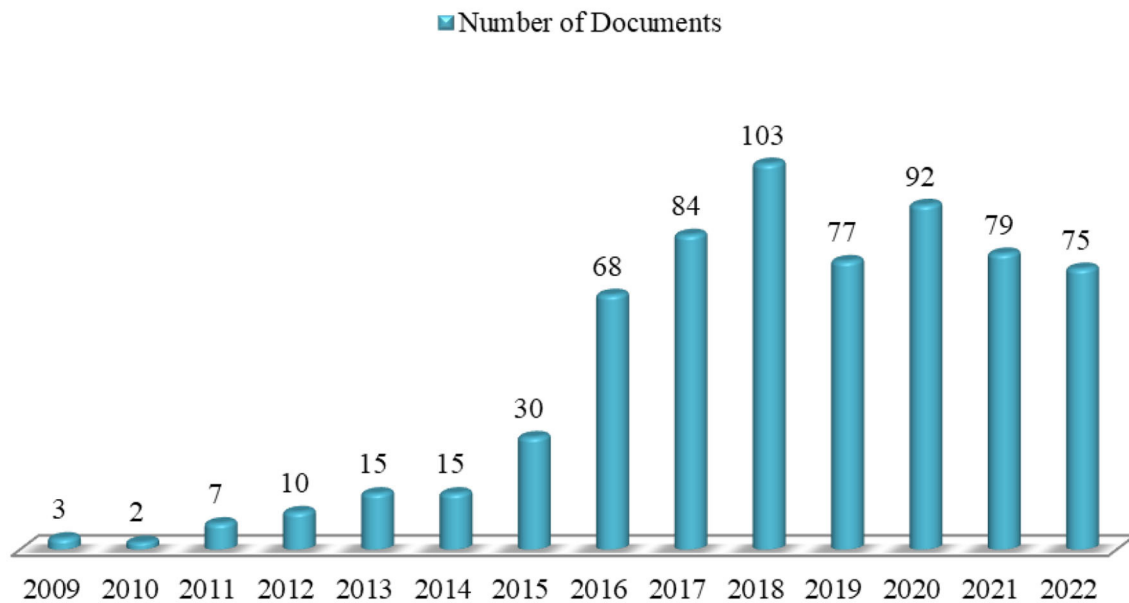


FIGURE 2  
Published documents on social media and terrorism by year. Source: Author analysis from Scopus (2022) database.

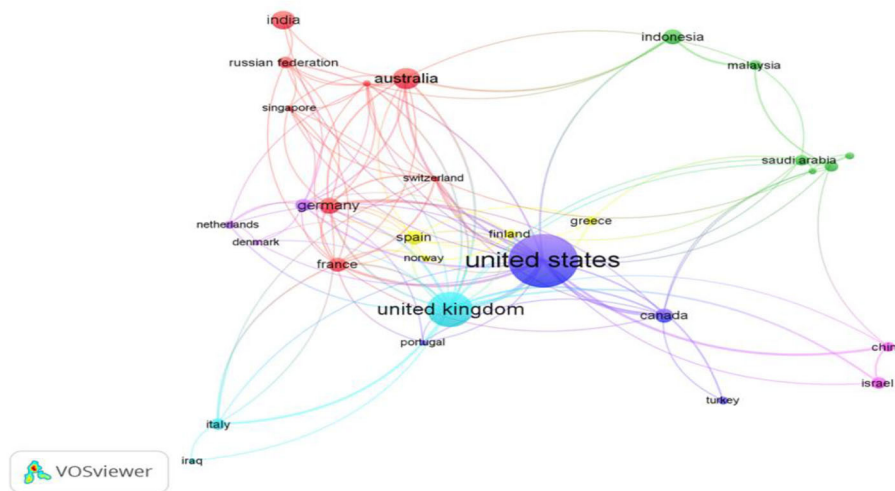


FIGURE 3  
Published documents on social media and terrorism by country or territory distribution. Source: Author analysis from VOSviewer.

RQ2 What are the critical themes related social media and terrorism in the scientific literature?

### Literature review

#### Bibliometric analysis

Bibliometric analysis is a widely used analytical method in present experimentation conditions (Mukherjee et al., 2022). In

this analysis, several statistical methods are often initially applied to analyze the books published on a specific topic (Leung et al., 2017). The implementation of the analytical method has also increased with time, regarding its application in various fields, including economics and business (Wang et al., 2020; Donthu et al., 2021), health (Berta et al., 2022), technology (Cobo et al., 2018), social sciences (Carammia, 2022), political issues (Subekti et al., 2022; Congge et al., 2023), urban studies (Sulistyaningsih et al., 2023), public administration (Roziqin et al., 2022), etc.

**TABLE 1** Cluster items by country or territory distribution of published documents on social media and terrorism.

The clusters		Number of documents	Total items
Clusters 1	Australia	44	8 Items
	France	22	
	Germany	28	
	India	36	
	Russian Federation	17	
	Singapore	5	
	South Africa	6	
	Switzerland	5	
Clusters 2	Indonesia	26	6 Items
	Malaysia	12	
	Pakistan	14	
	Saudi Arabia	15	
	Tunis	8	
	United Arab Emirates	6	
Clusters 3	Canada	23	4 Items
	Portugal	5	
	Turkey	10	
	United States	200	
Clusters 4	Finland	11	4 Items
	Greece	11	
	Norwegian	8	
	Spain	23	
Clusters 5	Denmark	5	3 Items
	Netherlands	9	
	Sweden	18	
Clusters 6	Iraq	5	3 Items
	Italy	16	
	United Kingdom	102	
Clusters	China	12	2 Items
	Israel	17	

Source: Author analysis from [Scopus \(2022\)](#) database.

The method is valuable for analyzing broad and open-ended topics with large data ([Chaudhari and Pawar, 2021](#)). This shows that the implementation of the method often involves large data and more than 100 documents ([Kalantari et al., 2017](#)), which are often obtained from Web of Science (WoS) and Scopus databases ([Gaikwad et al., 2021](#)). In addition, the use of bibliometric analysis method is able to help various scholars analyze the recent developments on a specific topic ([Vujković et al., 2022](#)).

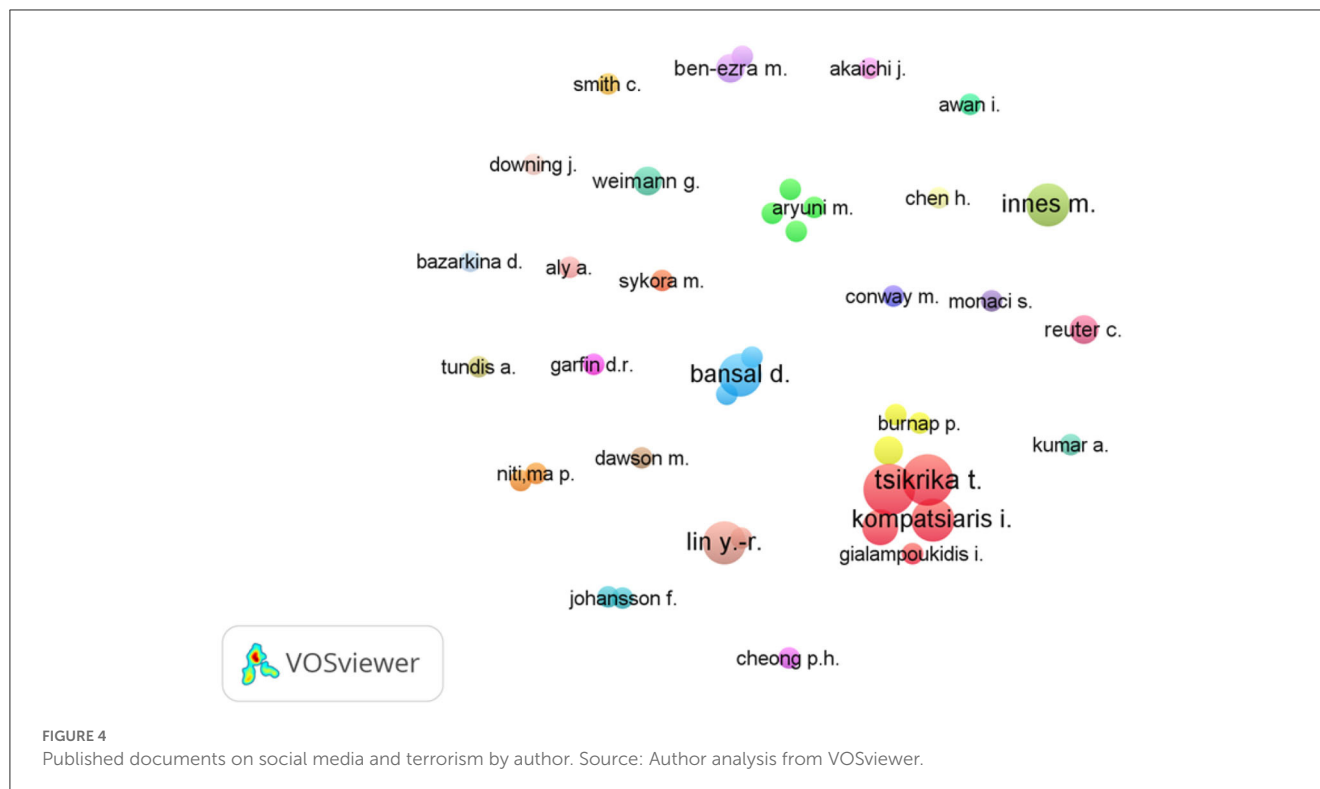
Based on this analysis, the visualization of several outputs is often enabled and easily understood through various tools, such as VOSviewer. By applying this tool, data mapping is

used to evaluate various trends in specific fields, including the number of yearly reports, the country with the highest published articles, the most prolific authors, the greatest funding affiliations and sponsors, as well as largest common types and fields of publication ([Donthu et al., 2021](#)). Moreover, several studies focusing on terrorism through bibliometric approaches included [Mumtaz and Sultan \(2011\)](#), which analyzed violent extremism from 1981 to 1990, regarding the Social Science Citation Index database (Web of Science). [Klona and Menzies \(2021\)](#) also evaluated terrorism within the scope of business studies, with [Loan \(2018\)](#) emphasizing the events of India and Pakistan.

## Social media and terrorism

The impact of social media on daily lifestyles is very substantial, due to its proliferation ushering in a new era of communication since 2017. This was because the technological development has replaced television and newspapers as primary information sources for people ([Ogunsuyi Opeyemi and Adebola, 2022](#)). Despite its positive effects, the development of new Internet technology still pose information and communication dangers to consumers ([Fedushko and Benova, 2019](#)). Social networking platforms are also ideal for developing a virtual environment, where people are able to share their thoughts, ideas, and daily activities through text, photographs, and videos. From this context, social media users are capable of inciting self-harm or public pain through the publication of some controversial issues, without solid and good self-control ([Fkih and Al-Turaif, 2023](#)). This condition has recently led to various considerations from the global community, regarding the problems of social media and terrorism ([Mohd et al., 2019](#)). In this case, several studies have been conducted on the intersection of these phenomena in various countries ([Scrivens et al., 2020](#)). This is due to the criminal nature of terrorism, which globally threatens the security of every country ([Kolajo and Daramola, 2017](#)). In this case, vigilance is highly essential, specifically in the increasing sophistication of information and communication technology. Therefore, the digital age and the proliferation of social media platforms have facilitated the emergence of cyberterrorism ([Odhiambo et al., 2018](#)).

Cyberterrorism is the use of internet facilities, including social media, to carry out intense terrorist activities ([Wilson, 2019](#)). This indicates that several terrorist groups have used social media to globally locate and recruit new members ([Combs, 2022](#)), conduct propaganda, prepare logistics and funding, as well as commit hacking crimes ([Winter et al., 2020](#)). Social media has also facilitated the dissemination of information about terrorist incidents in various countries ([Hatta et al., 2018](#)). Based on various reports, the ISIS and Al Qaeda groups were among the most active and popular terrorist networks using the technology to spread their propaganda ([Goyal et al., 2019](#)). The groups also had a strong offline presence and a new generation of tech-savvy followers. Understanding the patterns by which terrorists use social media is capable of informing policy decisions about developed counter-terrorism programs, which need to emphasize the cyber security elements heavily implemented by extremist



groups (Ogunlana, 2019). Governments and related parties should also develop various programs related to social network analysis, speech recognition, as well as face and object detection, to facilitate the early determination of digital terror threats (Naqvi et al., 2019).

## Materials and methods

### Data sources and search strategy

Figure 1 explains that the bibliometric data was obtained through the Scopus database, which was conducted in December 2022 using the TITLE—ABS—KEY (social media and terrorism) method. Since data were not limited to languages or regions, global search outputs and information were obtained. In this study, the specified period was from 2009 to 2022, to determine the publication trends on social media and terrorism.

### Data selection and extraction

A total of 670 international published documents on social media and terrorism were obtained through the Scopus database from 2009 to 2022. Using exclusion and inclusion methods (Aroyewun et al., 2022), these documents were reduced to 660 publications, which met the study criteria. In this case, 10 of the initially published documents were excluded due to a lack of information on the authors. This led to the repetitive collection of the exclusion and inclusion-based publications, which were then converted into CSV (Comma Separated Values) and RIS (Research Information System) formats, to serve as analytical data (Shoaib

et al., 2022). These data were used for analytical visualization regarding the international publication trend on social media and terrorism, as depicted in Figure 1.

## Data analysis and visualization

Data analysis was a crucial aspect of the study, which involved observing, assessing, understanding, analyzing, and interpreting the outputs from the information collection stage. This indicated that data were obtained through the Scopus database and reduced through the exclusion and inclusion methods, with the outputs converted into CSV and RIS formats. VOSviewer and Microsoft Excel were also used to facilitate the data analysis process, accompanied by the visualization of outputs through previously obtained CSV and RIS information. These information were analyzed by grouping the published documents from 2009 to 2022, leading to several classifications regarding various factors, such as the authors, affiliations, funding sponsors, field of study, type of publication, and other relevant information.

## Results

### International published documents on social media and terrorism by year

Social media and terrorism were interconnected topics garnering attention from the general public and authors, as shown in Figure 2. Based on the international publication frequency on social media and terrorism, a consistent increase was observed in

TABLE 2 Cluster items by author of published documents on social media and terrorism.

The clusters		Number of documents	Cluster total items
Clusters 1	Giampoukidis i.	3	5 Items
	Kalpakis g.	5	
	Compatriot i.	6	
	Tsikrika t.	7	
	Vrochidis s.	7	
Clusters 2	Aryani m.	3	4 Items
	Fernando Y.	3	
	Kibtiah tm	3	
	Miranda e.	3	
Clusters 3	Bansal d.	6	3 Items
	Chaudary m.	3	
	Saini jk	3	
Clusters 4	Akhgar b.	4	3 Items
	Burnap p.	3	
	Williams ml	3	
Clusters 5	Ben-ezra m.	4	2 Items
	Goodwin r.	3	
Clusters 6	Johansson f.	3	2 Items
	Kaati l.	3	
Clusters 7	Niti, ma p.	3	2 Items
	Pfefferbaum b.	3	
Clusters 8	Lin y. -r.	6	2 Items
	Wen x.	3	
Clusters 9	Akaichi j.	3	1 Item
Clusters 10	Aly a.	3	1 Item
Clusters 11	Cloud i.	3	1 Item
Clusters 12	Bazarkina d.	3	1 Item
Clusters 13	Chen h.	3	1 Item
Clusters 14	Cheong ph	3	1 Item
Clusters 15	Conway m.	3	1 Item
Clusters 16	Dawson m.	3	1 Item
Clusters 17	Downing j.	3	1 Item
Clusters 18	Garfin dr	3	1 Item
Clusters 19	Innes m.	6	1 Item
Clusters 20	Kumar a.	3	1 Item
Clusters 21	Monaci s.	3	1 Item
Clusters 22	Reuter c.	4	1 Item
Clusters 23	Smith c.	3	1 Item
Clusters 24	Sykora m.	3	1 Item
Clusters 25	Tundis a.	3	1 Item
Clusters 26	Weiman g.	4	1 Item

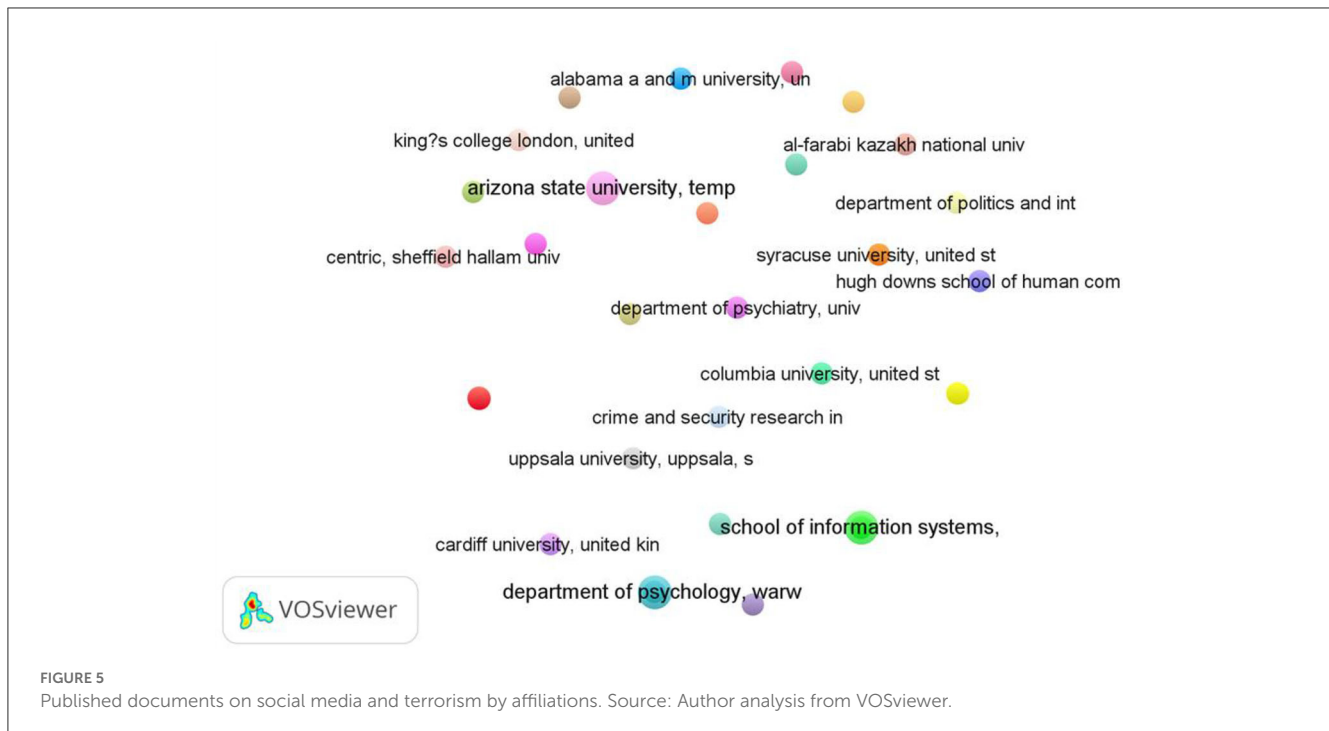
Source: Author analysis from VOSviewer.

several related documents from 2009 to 2018. However, a decrease was found in these documents from 2019 to 2022.

The trend of international publications on social media and terrorism was initiated in 2009 with only three published documents. These documents emphasized the issues related to communication crises, as well as the development of the information and interaction technology enabling the occurrence of digital crimes, such as terrorist activities. In 2010, the documents decreased to two, the lowest number of publications among the periods included in this study. These publications emphasized the use of social media for communication and sharing information about terrorism. Moreover, a sentiment analysis was used to identify public bias on social media content (Petrushka et al., 2020). This showed that the number of published documents increased in 2011, prioritizing the challenges posed by digital terrorism activities. In 2012, the documents increased to 10, with the topics emphasizing terrorist events on social media (Bernardi et al., 2012; Cheong and Lundry, 2012; Lemieux and Boyle, 2012; Waskiewicz, 2012). In 2013 and 2014, these publications subsequently increased with 15 each, regarding anti-terrorism activities (Sandoval, 2012; Lee, 2013; Staniforth and Nitsch, 2013) and the role of social media in sharing terrorist information (Burnap et al., 2014; Cheong, 2014; Holman et al., 2014; Simon et al., 2014).

The published documents increased to 30 in 2015, focusing on the use of Twitter in terrorism (Chatfield et al., 2015; Sutton et al., 2015; Trang et al., 2015; Wei et al., 2015). In 2016, these documents increased to 68, encompassing several topics related to social media and terrorism. These topics included the strategies to combat terrorism (Aistrop, 2016), information extremism incidents (Brajawidagda et al., 2016), and the use of social media by terrorists, to expand their global influence (Weimann, 2016). Furthermore, the number of published documents improved to 84 in 2017, based on detecting and combating terrorism on social media platforms, such as Twitter (Debnath et al., 2017; Gialampoukidis et al., 2017a,b; Sraieb-Koepf, 2017). In 2018, these documents reached 103, the highest level among the 660 publications included in this study. This emphasized various aspects of social media and terrorism, such as the use of Twitter in terrorist activities (Barbe et al., 2018; Cvetojevic and Hochmair, 2018; Steensen, 2018). However, the publication rate decreased to 77 in 2019, with most of them prioritizing terrorist activities on social media platforms, such as Twitter (Abrar et al., 2019; Albadi et al., 2019; Fakhurroja et al., 2019; Moussaoui et al., 2019).

In 2020, the publications slightly increased to 92, focusing on the conditions and activities of terrorism during the COVID-19 pandemic (Basit, 2020; Machitidze, 2020). These published documents then decreased to 79 and 75 in 2021 and 2022, encompassing the propaganda carried out by terrorists on social media (Pashentsev and Bazarkina, 2021; Kruglova, 2022). Based on these descriptions, the yearly elevation of the international publications on social media and terrorism demonstrated the interest and focus of the authors on this topic. This indicated that the publication rate declined when the authors were not specifically interested in studying the use of social media by terrorists. Meanwhile, the documents correspondingly increased when a high level of interest was observed among the authors. This is due to the increasingly widespread use of information and



communication technology in terrorism and radicalism, especially social media.

## International published documents on social media and terrorism by distribution country

In this study, understanding the distribution of published documents among different countries was essential, to identify those with the highest activity levels in producing social media and terrorism publications, as shown in Figure 3. The visualization of this data was also carried out by using the VOSviewer tool. Based on the results, the United States had the highest number of published documents on social media and terrorism, totaling 200 of the 660 publications being analyzed.

The United Kingdom was the next most significant contributor with 102 documents, accompanied by Australia, India, Germany, Indonesia, Spain/Canada, and France at 44, 36, 28, 26, 23, and 22 publications, respectively, as shown in Table 1.

## International published documents on social media and terrorism by authors and affiliations

The identification of authors and their affiliations was always crucial in any academic analysis. In this study, 660 published documents on social media and terrorism were analyzed, each of which had at least one author. To determine the authors with the most publications, a VOSviewer software was implemented, as depicted in Figure 4.

In this study, data visualization techniques were employed to identify the authors with the highest publications on social media and terrorism (Tsikrika et al., 2017). Based on the results, 41 authors were identified with international documents on this topic and divided into 26 groups, as depicted in Table 2. This indicated that Theodora Tsikrika and Stefanos Vrochidis had the highest number of published documents at six articles each, while other authors only had four or three publications.

Tsikrika and Vrochidis were scholars at the Information Technologies Institute, CERTH, Greece, specializing in security studies and ICT (information and communication technology), with their works including social media and terrorism analyses. Besides examining the authors of published documents, their affiliations were also observed. Using VOSviewer (Figure 5), Arizona State University had the most prominent data visualization, with 16 published documents on social media and terrorism. The School of Information Systems, as well as Bina Nusantara and Warwick (Department of Psychology) Universities also had many publications, with three each. These three institutions had the highest number of documents among all the affiliates, as shown in Table 3. Meanwhile, other affiliates had only two published documents.

## International published documents on social media and terrorism by type and subject area

In this study, the types of research and knowledge fields represented in international publications on social media and terrorism were analyzed. Based on Figure 6, the articles comprising

TABLE 3 Cluster items by affiliation of published documents on social media and terrorism.

The clusters		Number of documents	Total items
Clusters 1	Mississippi Crime Stoppers Board, Jackson, United States	2	5 Items
	Southern Illinois University, Carbondale, United States	2	
	Texas Christian University, Forth Worth, United States	2	
	The University of Mississippi, Oxford, United States	2	
	University of West Alabama, Livingstone, United States	2	
Clusters 2	Bina Nusantara University, International Relations Department, Jakarta, Indonesia	2	4 Items
	Bina Nusantara University, Management Department, Jakarta, Indonesia	2	
	Faculty of Industrial Management, University Malaysia, Pahang, Malaysia	2	
	School of Information Systems, Bina Nusantara University, Jakarta Indonesia	3	
Clusters 3	Alabama and m University, United States	2	3 Items
	National Graduate School of Quality Management, United States	2	
	University of Missouri, St. Louis, United States	2	
Clusters 4	Curtin University, Perth, Australia	2	3 Items
	Edith Cowan University, Australia	2	
	University of East Anglia, United States	2	
Clusters 5	Cardiff University, United Kingdom	2	2 Items
	Sheffield Hallam University, United Kingdom	2	
Clusters 6	Department of Psychology, Warwick University, United Kingdom	3	2 Items
	School of Social Work, Ariel University, Israel	2	
Clusters 7	Syracuse University, United States	2	2 Items
	University of Helsinki, Finland	2	
Clusters 8	Al-Farabi Kazakh National University, Kazakhstan	2	1 Item
Clusters 9	Arizona State University, United States	16	1 Item
Clusters 10	Centric, Sheffield Hallam University, United Kingdom	2	1 Item
Clusters 11	Columbia University, United States	2	1 Item
Clusters 12	Crime and Security Research Institute, Cardiff University, United Kingdom	2	1 Item
Clusters 13	Department of Politics and International Studies, University of Warwick, United Kingdom	2	1 Item
Clusters 14	University of Texas Southwestern Medical Center, Texas, United States	2	1 Item
Clusters 15	Hugh Downs School of Human Communication, Arizona States University, United States	2	1 Item
Clusters 16	Information Technologies Institute, Center for Research and Technology Hellas, Thessaloniki, Greece	2	1 Item
Clusters 17	Kings College London, United Kingdom	2	1 Item
Clusters 18	Lund University, Sweden	2	1 Item
Clusters 19	Royal Holloway, University of London, United Kingdom	2	1 Item
Clusters 20	Russian Presidential Academy of National Economy and Public Administration, Moscow, Russian Federation	2	1 Item
Clusters 21	School for Communication and Journalism, USC Annenberg, Los Angeles, United States	2	1 Item
Clusters 22	Science and Technology for Peace and Security, Germany	2	1 Item
Clusters 23	Swansea University, United Kingdom	2	1 Item
Clusters 24	Symbiosis Institute of Technology, Symbiosis International, India	2	1 Item
Clusters 25	University of North Carolina-Charlotte, United States	2	1 Item
Clusters 26	University of Sheffield, United Kingdom	2	1 Item
Clusters 27	Uppsala University, Uppsala, Sweden	2	1 Item

Source: Author analysis from Scopus (2022) database.



## International Publication Documents by Type of Publication

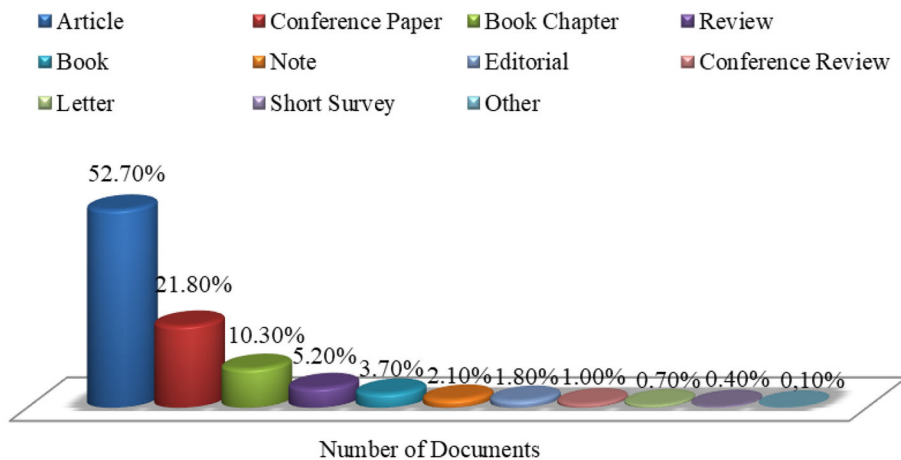


FIGURE 6  
Published documents on social media and terrorism by type of publication. Source: Author analysis from Scopus (2022) database.

## International Publication Documents by Subject Area of Publication

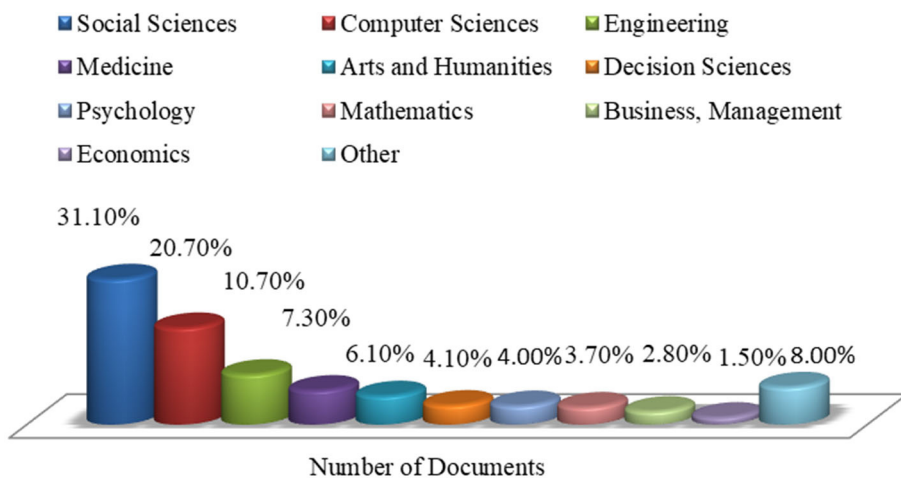


FIGURE 7  
Published documents on social media and terrorism by subject area of publication. Source: Author analysis from Scopus (2022) database.

52.70% or 348 published documents were highly common. This was accompanied by conference papers, book chapters, reviews, books, notes, editorials, conference reviews, letters, short surveys, and others at 21.80% (144 documents), 10.30% (68 publications), 5.20% (34 articles), 3.70% (24 documents), 2.10% (14 publications), 1.80% (12 articles), 1.00% (7 documents), 0.70% (5 publications), 0.40% (3 articles), and 0.10% or (1 document), respectively.

Figure 7 shows the visualization for the fields with the most published documents on social media and terrorism. These data indicated that the social sciences had the highest value

of published documents, with 31.10% or ~206 publications. Other disciplines with a relatively high number of documents included computer sciences, engineering, medicine, arts and humanities, decision science, psychology, mathematics, business and management, economics, and other fields, at 20.70% (137 documents), 10.70% (71 publications), 7.30% (48 articles), 6.10% (40 documents), 4.10% (40 publications), 4.00% (27 articles), 3.70% (26 documents), 2.80% (25 publication), 1.50% (9 articles), and 8.00% (52 documents), respectively.

### International Publication Documents by Funding Sponsor

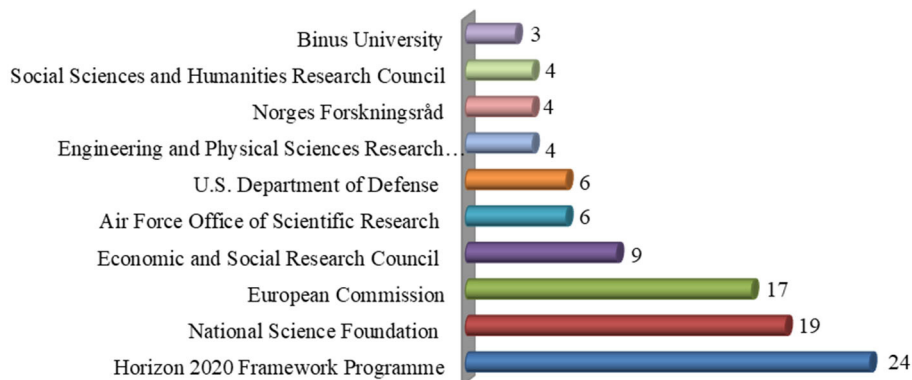


FIGURE 8 Published documents on social media and terrorism by funding sponsor of publication. Source: Author analysis from Scopus (2022) database.

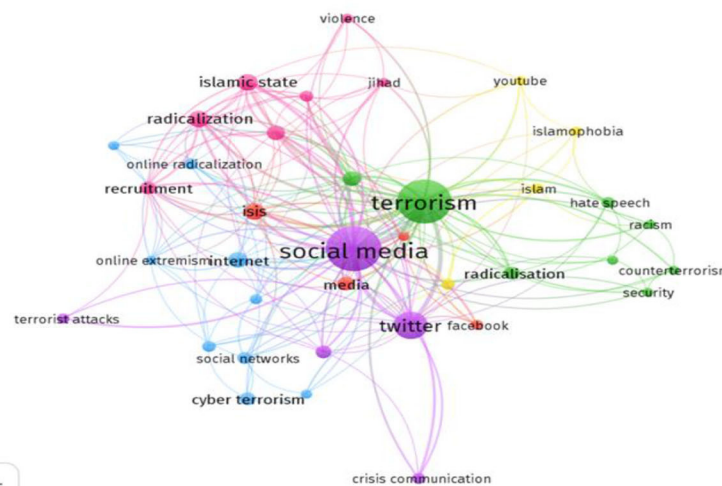


FIGURE 9 Co-occurrence network of published documents on social media and terrorism. Source: Author analysis from VOSviewer.

### International published documents on social media and terrorism by funding sponsor

The Scopus database was used to identify the sponsoring agencies that funded publications on social media and terrorism. These funding institutions were observed through Microsoft Excel and visualized in Figure 8.

Based on Figure 8, the highest funding sponsor for social media and terrorism publications was the Horizon 2020 Framework

Program (Downing and Dron, 2022), which funded 24 documents. This was accompanied by the National Science Foundation (NSF) (Wormwood et al., 2019) and the European Commission (Jamil et al., 2022), which provided significant funding, with 19 and 17 articles, respectively. The ESRC (Economic and Social Research Council) also funded 9 documents, with the AFOSR (Air Force Office of Scientific Research) and the US Department of Defense each funding six publications. Moreover, the EPSRC (Engineering and Physical Sciences Research Council), Norges Forskningsråd, Social Sciences, and Humanitarian Research Council each funded four documents, with Binus University funding three publications.

**TABLE 4** Cluster items by co-occurrence network of published documents on social media and terrorism.

The clusters		Total items
Clusters 1	Artificial intelligence, cyber terrorism, digital security, foreign fighters, Internet, online extremism, virtual radicalization, social media analytics, and public networks	9 Items
Clusters 2	Counter-terrorism, extremism, hate speech, racism, radicalization, security, social network, and terrorism	8 Items
Clusters 3	Islamic State, jihad, propaganda, radicalization, recruitment, violence, and violent extremism	7 Items
Clusters 4	Communication, crisis interaction, social media, terrorist attacks, and Twitter	5 Items
Clusters 5	Cyberterrorism, Facebook, isis, and media	4 Items
Clusters 6	Counter-terrorism, Islam, Islamophobia, and Youtube	4 Items

Source: Author analysis from VOSviewer.

## Co-occurrence network of international published documents on social media and terrorism

In this study, the social media and terrorism publications had several keywords, which were used by various authors as experimental priorities (Miranda et al., 2020). The co-occurrence network of these keywords was also visualized using VOSviewer (Figure 9) and divided into cluster categories (Table 4). Based on the data visualization, specific keywords, such as social media, terrorism, and Twitter, were frequently used in the 660 Scopus-oriented published documents.

From these keywords, social media had the most prominent data visualization and was part of a cluster that included related terms such as communication, crisis interaction, terrorist attacks, and Twitter (Figure 9). Furthermore, terrorism was the next most prominent keyword, accompanied by Twitter. Based on Table 4, the co-occurrence network of social media and terrorism publications was also divided into 6 clusters, each containing different keywords.

## Discussion

A bibliometric analysis was employed to examine the trends in international publications on social media and terrorism. This analysis emphasized various data visualization tools, to facilitate and expedite the evaluation of large published document volume. In this study, a total of 660 Scopus-oriented publications from 2009 to 2022 was analyzed, with several interesting trends identified.

Firstly, the published document trend significantly increased since 2015, with a peak of 103 publications in 2018. This trend was attributed to the rapid development of social media and its increasing use by terrorist groups, such as ISIS, to strengthen

and intimidate their legitimacy and opponents, respectively (Sweeney and Kubit, 2020). From this context, the influence of terrorist movements was more conspicuous in carrying out their mission (Schreer and Tan, 2019). The patterns by which social media was used to counter terrorism and rebuild normalcy within society was also examined regarding terrorist attacks. For example, the hashtags, #KitaTidakTakut (“We are not afraid”) and #JakartaBerani (“Jakarta is brave”), were used following the bomb attack in Jakarta on January 14, 2016 (Brewot et al., 2019). Similarly, emergency organizations and military or police forces had employed social media, to detect and understand the movements and actions of terrorist groups during attacks (Jain and Vaidya, 2021).

Secondly, the US (United States), the UK (United Kingdom), and Australia conducted the most studies on social media and terrorism. These countries had a strong interest in ensuring the security of their citizens and national likenesses in various regions, as terrorism and the use of internet media had become global threats (Nobles and Williams, 2017). This indicated that various publications on the threat of terrorism, including the use of social media, were the focus of the studies proposed by the US, the UK, and Australia. The uncontrolled dissemination of information through social media also negatively affected society, such as causing trauma and fear (Holman et al., 2014). For these three countries, the existence of internet platforms need to be controlled to protect their national interests. This should align with various social media facilities such as websites, blogs, public networking sites, forums, video sharing services, Facebook, Twitter, Instagram, YouTube, etc, which were predominantly owned by western companies, specifically America (Weimann, 2016).

Thirdly, the most commonly discussed topics were terrorism, Twitter, cyberterrorism, extremism, radicalization, violence, recruitment, terrorist attacks, and propaganda. These topics reflected the observations of the authors studying social media and terrorism, which identified the need to anticipate and mitigate the various threats posed through online platforms and friends (Waskiewicz, 2012). Moreover, the evaluation of these topics required subsequent investigation, to minimize the negative impact of social media on the increasing activities of terrorist groups. Some stakeholders were also expected to immediately perform some actions against various social accounts capable of spreading radical ideology through the Internet (Kibtiah et al., 2020).

## Conclusion

Based on the results, the international publications on social media and terrorism specifically experienced a significant increase since 2015, due to the influence of internet media platforms. This showed that the trend peaked in 2018, with a total of 103 published documents emphasizing various topics related to social media, terrorism, Twitter, cyberterrorism, extremism, recruitment, radicalization, propaganda, and terrorist attacks.

The results also showed that the articles in the field of social sciences dominated these international publications. This proved that the US, the UK, and Australia were the most common countries of publication, due to the protection

of their national interests from the terrorism threats. From the results, the authors having the most published documents were Tsikrika T. and Vrochidis S., with Horizon 2020 Framework Program being the top funding sponsor. Besides examining the relationship between social media and terrorist attacks, the potential impacts of terrorism through internet facilities, specifically social media, were anticipated and mitigated.

## Data availability statement

The datasets presented in this article are not readily available because for preliminary analysis, raw data is not accessible. Don't hesitate to get in touch with GY if you would like to request access to this dataset. Requests to access the datasets should be directed to [gonda@umm.ac.id](mailto:gonda@umm.ac.id).

## Author contributions

All authors provided equal contributions to the writing of this article. All authors contributed to the article and approved the submitted version.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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