Examining the trend of the research on cybercrime: a bibliometric review

By

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Abstract

Cybercrime has recently become a major scientific emphasis, as seen by an increase in the number of papers on the subject. The bibliometric analytical technique is proposed in this article to evaluate cybercrime research. In addition, this research aims to conduct a bibliometric analysis of scopus publications related to cybercrime. On july 15, 2022, in the foreground, for precise and complete examination, the screening procedure looked for all references to "cybercrime" in all scopus topic areas and found 377 scholarly contributions. As a result, the findings include a publication time frame ranging from 1998 to 2022. The findings show increased academic interest in the research issue, particularly from 2005 to now, emphasising cybercrime in computer science. The united states leads the contributing countries in cybercrime research. The most productive researchers were grabosky, p., and broadhurst, r. With the highest number of publications. The collaborative index showed an increasing trend from 1998 onwards. International journal of cyber criminology is the most prestigious journal in the field of cybercrime research. The australian national university, on the other hand, is the most productive affiliation in cybercrime research. This paper contributes to the field by evaluating the current status of cybercrime research, identifying gaps in the literature, and most importantly, proposing a research agenda.

Keywords: bibliometric analysis, cybercrime, r studio, scopus database.

Introduction

Cybercrime, often known as computer crime, is the criminal use of a computer to achieve illegal goals such as fraud, trafficking in child pornography and intellectual property, stealing identities, or privacy invasion (moore, 2014). Cybercrime, particularly over the internet, has grown in prominence as computers have become increasingly important in business, entertainment, and government (luppicini, 2014). The nonlocal nature of cybercrime is an essential aspect: acts can take place in jurisdictions separated by great distances. This presents significant challenges for law enforcement because, previously, local or even national crimes now necessitate international cooperation (chopra, 2020). The majority of cybercrime involves an attack on personal, corporate, or government information. Although the attacks do not target physical bodies, they do target personal or corporate

virtual bodies, which are the set of informational qualities that define persons and entities on the internet (nasution et al., 2018). In other words, our virtual identities are crucial parts of daily life in the digital age: we are a collection of numbers and identifiers stored in many computer systems held by governments and companies (sandywell, 2013). Cybercrime emphasises the importance of networked computers in our lives, as well as the vulnerability of supposedly firm truths like human identification (joshi, 2013).

Cybercrime research began in 1998. Since then, scholars have extensively employed this concept to further investigate the effects of cybercrime. As a result, the purpose of this study is to conduct a bibliometric analysis of the scientific literature published on the subject of cybercrime. Bibliometric analysis is a quantitative tool for examining the knowledge structure and evolution of study fields through an examination of relevant publications. (ahmi et al., 2019). The most commonly used indicators in bibliometric analysis are authorship, publication classification, citations, impact, publication volume, and country of origin (aidi ahmi, 2019). According to rehn et al., quantitative assessments of research publications are commonly used in bibliometric evaluations of scientific research. The vast majority of scientific observations and empirical discoveries are eventually published in scientific journals, where they can be read and cited by other scholars (rehn et al., 2007).
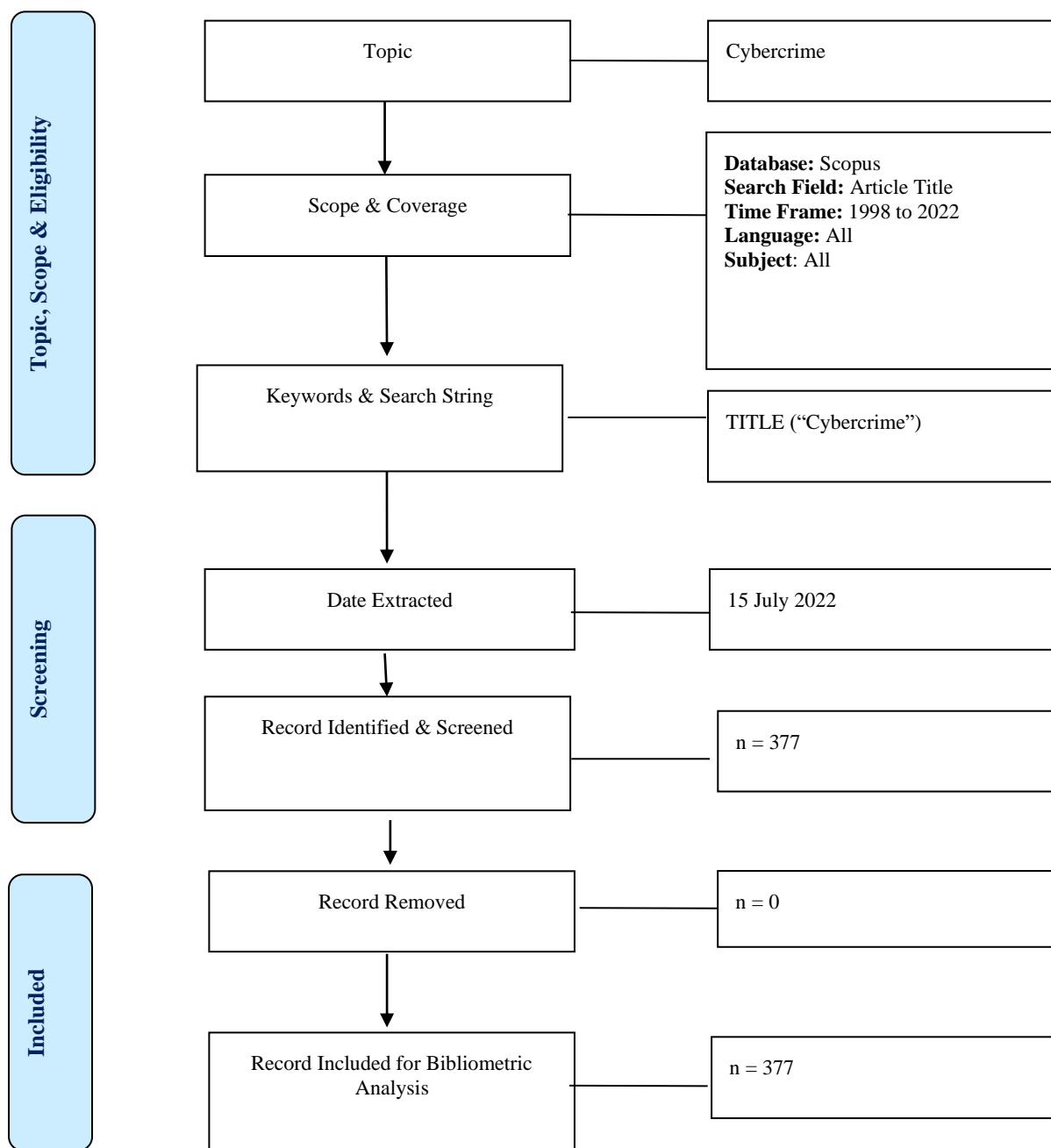
The present section covers the goal of conducting a bibliometric study, whereas the following section describes the methodologies used to conduct this research. The third section presents the results of the essential bibliometric indicators. The final portion summarises the conclusion and future research directions.

Methods

The bibliometric analysis method was employed to achieve the study's objectives. This method provides quantitative analysis for the literature review (van leeuwen, 2006). Without subjectivity, bibliometric analysis leads to a study of performance and mapping of research trends in a certain research field to demonstrate the most recent progress and direction for future research gaps in that sector (zupic & čater, 2014).researchers benefit from the bibliometric analysis since it directs them to the most important papers on their subject.

the process of literature selection is crucial in bibliometric analysis to assure the subject's validity and consistency. To achieve the goals of this paper, the researchers took the approach depicted in figure 1. First and foremost, the researchers determined the scope of the investigation. They stated the research topic, the database to be used, and the time range. Following the scope determination, we proceeded to the second step, data screening, which comprised determining and extracting bibliometric data. The biblioshiny function found inside the r platform was utilized in order to carry out the bibliometric analysis of the compiled contributions.

As a bibliometric study, this research focuses on a computer-assisted review approach for identifying key research or authors and their relationships by examining all publications connected to a specific topic or field (de bellis, 2009). This study's data were obtained from the scopus database and stored on july 15, 2022. From 1998 until 2022, the phrase "cybercrime" was used as a search term in document titles. The scopus database was chosen for a comprehensive search because of its widespread awareness among researchers and high level of trustworthiness (sharma, 2021). Accordingly, the researchers in this study had included all the 377 documents that were identified and downloaded from the said period for further analysis, as shown in figure 1

Topic, Scope & Eligibility

Topic	Cybercrime
Scope & Coverage	**Database:** Scopus **Search Field:** Article Title **Time Frame:** 1998 to 2022 **Language:** All **Subject**: All
Keywords & Search String	TITLE ("Cybercrime")

Screening

Date Extracted	15 July 2022
Record Identified & Screened	n = 377

Included

Record Removed	n = 0
Record Included for Bibliometric Analysis	n = 377

Figure 1: *research protocol*

Results

general information

Table 1 displays information gathered using the bibliometrics analysis tool biblioshiny. There are 377 contributions from 242 different sources in all. This illustrates that publications on "cybercrime" are scattered throughout a wide range of sites, with no centralised repository where the works can be stored. Furthermore, whereas 737 authors contributed to these works, only 106 were written by a single author. The collaboration index is 2.66, which is considered to be a relatively high rate given the breadth and interdisciplinarity of this subject topic. This is because it is difficult for a single author to completely comprehend the concept of cybercrime in numerous regulatory regimes all over the world. As a result, the collaboration of multiple writers in the development of a single paper on cybercrime is justified.

Table 1*: general information*

Description	Results
Main information about data	
Timespan	1998:2022
Sources (journals, books, etc.)	242
Documents	377
Average years from publication	8.12
Average citations per document	5.029
Average citations per year per doc	0.711
References	8854
Document contents	
Keywords plus (id)	1070
Author's keywords (de)	796
Authors	
Authors	737
Author appearances	884
Authors of single-authored documents	106
Authors of multi-authored documents	631
Authors collaboration	
Single-authored documents	140
Documents per author	0.512
Authors per document	1.95
Co-authors per document	2.34
Collaboration index	2.66

Document and source type

The researchers in this study classified the documents collected from the scopus database based on the document type, source type, and source title. Documents used for cybercrime publishing include journal articles, book chapters, reviews, books, editorials, notes, conference papers, letters, and erratum. Table 2 shows the document type analysis for this investigation. Less than half (149, 39.52%) of cybercrime contributions are published in journal articles, with conference papers coming in second (112, 29.71 percent). The book chapter accounts for 67 percent of total publications, whereas erratum has the fewest with only one.

Table 2. *Document type*

Document type	Total publications (tp)	Percentage %
Article	149	39.52%
Book	4	1.06%
Book chapter	67	17.77%
Conference paper	112	29.71%
Conference review	11	2.92%
Editorial	7	1.86%
Erratum	1	0.27%
Note	6	1.59%
Retracted	1	0.27%
Review	14	3.71%
Short survey	5	1.33%
Total	377	100.00%

languages of documents

Table 3 shows that english is commonly used in the works in this field (371; 98.41 percent). Other languages in which this subject is widely written include russian, polish, portuguese, turkish, and ukrainian.

Table 3. *Languages*

Language	Total publications (tp)	(%)
English	371	98.41%
Russian	2	0.53%
Polish	1	0.27%
Portuguese	1	0.27%
Turkish	1	0.27%
Ukrainian	1	0.27%
Total	377	100.00%

Subject area

This study also contained a list of published documents related to the study's subject areas. Computer science accounted for 60.74 percent of all cybercrime papers, followed by environmental science (25.72%). Table 4 lists the additional topics of cybercrime research that were discussed.

Table 4. *Subject area*

Subject area	Frequency
Agricultural and biological sciences	1
Arts and humanities	10
Biochemistry, genetics and molecular biology	4
Business, management and accounting	28
Chemical engineering	5
Chemistry	2
Computer science	229
Decision sciences	29
Earth and planetary sciences	1
Economics, econometrics and finance	21
Energy	9
Engineering	97
Environmental science	7
Health professions	1
Materials science	2
Mathematics	32
Medicine	20
Multidisciplinary	3
Pharmacology, toxicology and pharmaceutics	2
Physics and astronomy	4
Psychology	2
Social sciences	141

Descriptive bibliometric analysis

The descriptive bibliometric analysis is divided into seven sections: annual publication trends, most prolific authors, most cited papers, publishing activity by nation, publishing activity by affiliations, journal publishing activity, and most often used keywords.

number of annual publications

Figure 2 depicts the annual publication patterns from 1998 through 2022. The trendline shows that the dispersion has grown significantly during the last few years. A substantial increase in publications has been documented over the preceding two decades (2001–2010: 96 or 25.46 percent; 2011–2020: 243 or 64.45 percent). For the first time in history, the total number of publications linked to cybercrime exceeded 39 works in 2017. The number of papers released each year is increasing overall. This expanding tendency indicates that scholars, practitioners, and regulators are paying more attention to cybercrime.
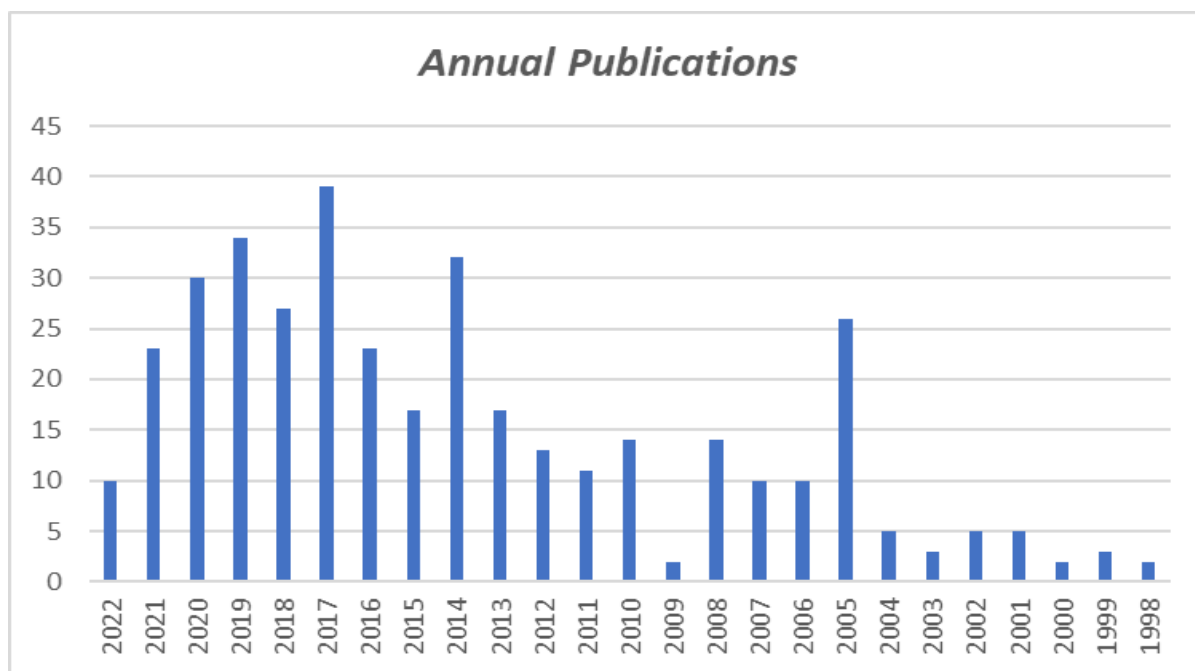
Figure 2: number of publications per year

3.5.2 authorship analysis

This study also identifies the most productive writers who contributed to the publishing of cybercrime studies. A total of 377 contributions came from 737 distinct writers. Table 5 lists the ten most productive authors on the subject of cybercrime. Grabosky, p. Has the most publications with eight. Despite having six contributions, broadhurst, r. Has received the most citations (202). W. Mazurczyk is the second most productive contributor, with five publications.

Table 5: *details of 10 most productive authors*

Author's name	Affiliation	Country	Tp	Tc	H	G
Grabosky, p.	The australian national university	Australia	8	134	3	8
Broadhurst, r.	The australian national university	Australia	6	202	3	6
Mazurczyk, w.	Politechnika warszawska	Poland	5	2	1	1
Csonka, p.	European commission	Belgium	4	7	3	2
Harkin, d.	Deakin university	Australia	4	26	7	4
Nykodym, n.	The university of toledo	United states	4	55	6	4
Szczypiorski, k.	Politechnika warszawska	Poland	4	2	17	1
Taylor, r.	The university of toledo	United states	4	26	4	4
Whelan, c.	Deakin university	Australia	4	26	10	4
Choo, k.k.r.	The university of texas at san antonio	United states	3	9	78	3

Notes: *Tp=Total Number Of Publications; Tc=Total Citations; H=H-Index; And G=G-Index*

3.5.3 most cited papers

Table 6 displays the top ten most cited publications from the scopus database in terms of citations. Using global citations makes tracking the annual citation frequency simpler. With 98 citations, or an average of 49 citations per year, the most referenced work is an article authored by harjinder singh lallie in 2021 titled " cyber security in the age of covid-19: a timeline and analysis of cyber-crime and cyber-attacks during the pandemic." this is followed by "an analysis of the nature of groups engaged in cybercrime, international journal of cyber criminology" (broadhurst et al., 2014) with 98 total citations or an average of 10.88 citations annually. As a consequence, roderic broadhurst's 2006 paper "developments in the global law enforcement of cybercrime" is the third most referenced, with 94 citations, or an average of 5.52 citations per year.

Table 6: *10 most cited documents*

Document	Title	Doi	Tc	Tc per year
(lallie et al., 2021)	Cyber security in the age of covid-19: a timeline and analysis of cyber-crime and cyber-attacks during the pandemic	10.1016/j.cose.2021.102248	98	49
(broadhurst et al., 2014)	An analysis of the nature of groups engaged in cyber crime, international journal of cyber criminology	Na	98	10.8889
(broadhurst, 2006)	Developments in the global law enforcement of cyber-crime	10.1108/13639510610684674	94	5.5294
(liang & lu, 2010)	Internet development, censorship, and cyber crimes in china	10.1177/1043986209350437	75	5.7692
(huey et al., 2013)	'uppity civilians' and 'cyber-vigilantes': the role of the general public in policing cyber-crime	10.1177/1748895812448086	63	6.3
(brown, 2015)	Investigating and prosecuting cyber crime: forensic dependencies and barriers to justiceresponsibility? Lessons from law and neuroscience	10.5281/zenodo.22387	57	7.125

(mccusker, 2017)	Transnational organised cyber crime: distinguishing threat from reality	10.1007/s10611-007-9059-3	46	2.7059
(lagazio et al., 2014)	A multi-level approach to understanding the impact of cyber crime on the financial sector	10.1016/j.cose.2014.05.006	42	4.6667
(kshetri, 2010)	Diffusion and effects of cyber-crime in developing economies	10.1080/01436597.2010.518752	34	2.6154
(ch et al., 2020)	Computational system to classify cyber crime offenses using machine learning	10.3390/su12104087	31	10.3333

Most cited countries

The nations with the greatest contributions to cybercrime research are listed in table 7. There are 269 citations in this topic from usa, which suggests that american researchers are among the world's leading experts in cybercrime. With 252 citations, australia ranks in second place.

Table 7: *10 most cited countries*

Country	Total citations	Average article citations
Usa	269	14.944
Australia	252	16.8
United kingdom	244	18.769
Canada	83	16.6
Saudi arabia	52	7.429
Nigeria	51	7.286
India	35	1.25
Netherlands	29	14.5
South africa	29	5.8
Malaysia	28	4.667

most productive affiliations

The 10 affiliations in the area of cybercrime with the highest productivity are listed in table 8, along with the number of publications linked to each institution. The australian national university, politechnika warszawska, and amity university are a few of the well-known universities that have written about cybercrime. Delta state university nigeria, university of hong kong, university of toledo, vellore institute of technology, deakin university, and university of ibadan are in third place with four papers each.

Table 8: *the 10 most productive affiliations*

Affiliations	No. Of articles	Country	Percentage of articles
The australian national university	13	Australia	3.45%
Politechnika warszawska	6	Poland	1.59%
Amity university	6	India	1.59%
University of ibadan	4	Nigeria	1.06%
The university of hong kong	4	Hong kong	1.06%
Delta state university nigeria	4	Nigeria	1.06%
Vellore institute of technology	4	India	1.06%
Deakin university	4	Australia	1.06%
The university of toledo	4	United states	1.06%
Sultan agung islamic university	3	Indonesia	0.80%

most productive journals

It is noteworthy that the 377 articles obtained for this study were in 242 different sources. Table 9 provides a list of the top ten journals with the most cybercrime-related publications. With 16 submissions, or 4.24 percent of all contributions, the international journal of cyber criminology seems to be the journal that focuses the most on the subject of cybercrime. Following that, there are 11 publications devoted to lecture notes of the institute for computer sciences social informatics and telecommunications engineering lnicst journal. With 10 contributions, the journal of cyber crime the challenge in asia comes in as the third most productive journals.

Table 9: *10 most productive journals*

Source	No of publications	H_index	G_index	M_index	Tc	Py start
International journal of cyber criminology	16	7	16	0.7	269	2013
Lecture notes of the institute for computer sciences social informatics and telecommunications engineering lnicst	11	1	1	0.083333333	1	2011
Cyber crime the challenge in asia	10	2	3	0.111111111	12	2005
Cyber crime	9	3	3	0.166666667	18	2005
Advances in intelligent systems and computing	7	2	2	0.222222222	11	2014
Computers and security	7	3	7	0.12	159	1998
Computer law and security report	6	3	6	0.130434783	61	2000
Itnow	6	1	1	0.083333333	1	2011
2017 2nd international conference on anti cyber crimes icacc 2017	5	2	4	0.333333333	22	2017
Cyber crime and cyber terrorism investigator s handbook	5	2	4	0.222222222	19	2014

most frequent keywords

The top ten author keywords are shown in table 10. "crime," which is mentioned 128 times, is the term that authors utilise the most. Second place goes to "cyber-crimes," which has 104 occurrences. As shown in table 10, "computer crime," "cyber crime," "cybercrime," "cyber security," "security of data," "internet," "cyber-crime," and "network security" are frequently used terms in cybercrime study with more than 20 occurrences.

Table 10: *15 top keywords*

Author keywords	Occurrences
Crime	128
Cyber-crimes	104
Computer crime	92
Cyber crime	76
Cybercrime	45
Cyber security	35
Security of data	35
Internet	33
Cyber-crime	24
Network security	22
Cyber crimes	17
Personal computing	15
Computer forensics	14
Cyber-attacks	14
Digital forensics	14

Conclusion

The increased reliance of today's businesses, communities, and individuals on the internet and cybercrime go hand in hand. This has drawn a lot of interest from academics around the world who are examining and suggesting potential solutions to cope with the challenges surrounding cybercrimes. This study has started a review of all types of academic publications on this area that have been made as a result. The research uses a few bibliometric variables that were acquired from the scopus database to report the trend of prior works. 377 papers' bibliometric data was retrieved in total from the scopus database. The findings show that in nearly 98% of the documents that were found, english becomes the main language. Nearly 43% of documents have two or three authors, compared to 37% of documents that are single-authored. The data also reveals a long-term trend toward an increase in the number of writers per document. In terms of writers who contributed, the usa claimed having the most, followed by australia and the uk. However, several european and asian nations have made major scientific contributions to this field of study.

Cybercrime-related issues are discussed across a range of academic disciplines, including computer science, social sciences, and engineering. Nevertheless, computer science is the category in which more than half of the papers under examination belong. In another regard, since 2005, there have been more publications on cybercrime. This analysis shows a larger average number of authors per document throughout time, along with a rise in the number of publications every year. In some ways, this pattern suggests increased author collaboration in this field.

Readers should be aware of a few limitations despite the article's insightful observations. First of all, no search term can fully encompass all the academic papers in this

field. As a result, inaccurate results—both good and negative—are always expected. In order to rank the authors and institutions included in this study, writers used scopus' definition. Additionally, some authors or organisations could register their names under several spellings or in many places in scopus. As a consequence, the correctness of their authorship and affiliation data was produced. Despite these drawbacks, our research was among the first to examine bibliometric indications in the literature on cybercrime.

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