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The evolution and trends in IT governance research: A bibliometric analysis

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Abstract

Information technology (IT) governance has become a crucial area of study because of the growing corpus of research in the area. This study aims to conduct both a literature review and bibliometric analysis focusing on three specific research questions: (RQ1) examining the trends in publications and citations, (RQ2) recognizing the most impactful countries, journals, and authors, and (RQ3) investigating popular research areas and trending topics in IT governance. Data surrounding IT governance research were obtained through the Scopus database, with a total of 1,510 documents published from 1995 to February 2023. The extracted documents were analysed using Harzing's Publish or Perish, VOSviewer, and Bibliometrics sub-tool Biblioshiny software. Publications have continued to rise since 2004 when the United States has had the greatest influence over IT governance publication and research collaboration, while Indonesia is the most prolific. Primary sources on IT governance research were taken from conference proceedings related to IT topics. As for authors, Pereira R from Portugal is at the top of the list while Van Grembergen W from Belgium is the most influential. This study is the first to identify and propose themes and current hotspots in IT governance research which serves as a guide for future researchers and professionals.

Keywords: Information technology governance, Scopus, Harzing's Publish or Perish, VOSviewer, Bibliometrics

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Introduction

Information technology (IT) governance is a set of processes, policies, and controls that businesses use to align their IT systems with business goals, secure them, comply with legal and regulatory requirements, and effectively manage and monitor them (Selig & Wilkinson, 2008). IT governance is also linked to corporate governance (Abu-Musa, 2005). Board roles, board composition, board characteristics, board organizational structure, and board organizational processes to design, implement, and monitor business strategy are all issues of corporate governance (Korac-Kakabadse & Kakabadse, 2001). The concept pertains to processes and systems for formulating and managing strategic IT decisions, along with the distribution of IT decision-making authority and responsibilities among various organizational stakeholders. (Peterson, 2004). The COBIT, IT infrastructure library (ITIL), and ISO/IEC 38500 frameworks include principles, processes, and best practices for managing IT resources and supporting the organization's strategic goals (ISCA, 2021).

IT governance is a multidimensional topic and has emerged as an important area of study as the body of literature in this field is expanding quickly (Priyadarsini & Kumar, 2022). To date, there are only a few bibliometric analyses (Mumu et al., 2021, 2022; Effah, 2022; Pahlevi, 2022; Ellili, 2023) and systematic reviews (Mece et al., 2020; Nyakurukwa & Seetharam, 2022) related to corporate governance. With only one bibliometric analysis paper focusing on IT governance published in 2016 (Cunha & Froger, 2016). The bibliometric study was performed between 2003-2013 using Brazilian and international databases, with the addition of searches in digital libraries and sites of the main publisher (Cunha & Froger, 2016). As such, there is a deep need to conduct a bibliometric analysis for IT governance using comprehensive databases like Scopus' (Zhu & Liu, 2020; Pranckute, 2021). This review paper aims to extensively investigate IT governance by utilizing both established bibliometric techniques. There are three research questions: (RQ 1) to look at publication and citation trends, (RQ 2) to identify the most influential countries, journals, and authors, and (RQ 3) to explore research hotspots and trending topics for IT governance search.

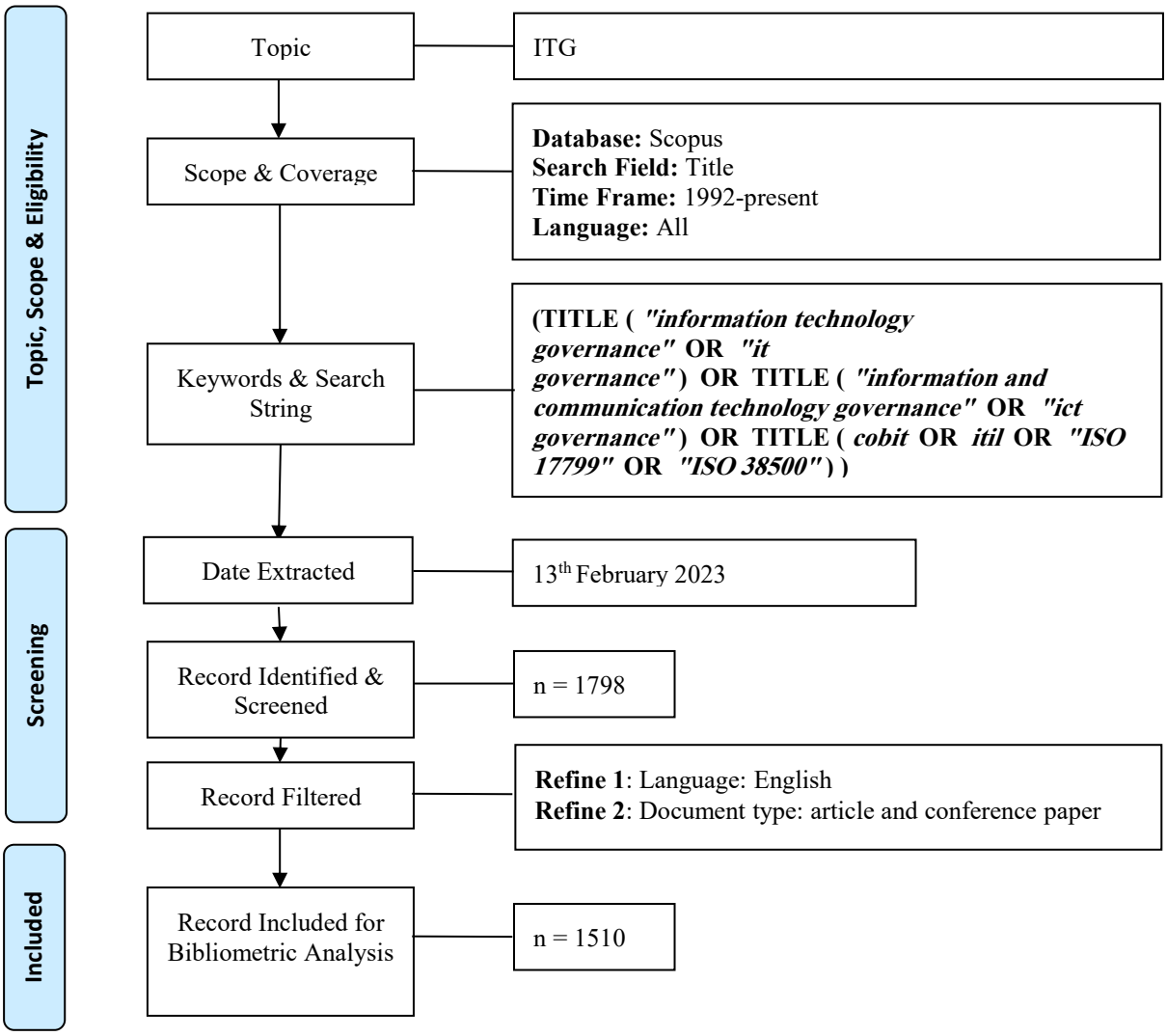
Methodology

The data for this study were retrieved and downloaded from Scopus' database on February 16, 2023. The search terms used are "information technology governance" OR "it governance" OR "information and communication technology governance" OR "ict governance" OR cobit OR itil OR "ISO 17799" OR "ISO 38500" in the article title. All English-language documents from 1992 to January 16, 2023, were included, including primary study documents i.e., articles and conference proceedings published in the English language. Journal articles and conference proceedings are both useful for scientific objectives, however in certain disciplines, the former is regarded as a more formal and less transient research output (González-Albo & Bordons, 2011). In the end, 1510 documents of which 994

were proceedings and 516 were original articles met the criteria and were downloaded for further analyses (Figure 1).

Figure 1

PRISMA flowchart on the search strategy.



Harzing's Publish or Perish software (Harzing, 2007) was used for citation analysis while the Bibliometrics sub-tool Biblioshiny (Aria & Cuccurullo, 2017) and VOSviewer (Van Eck & Watman, 2020) were used for performance and science mapping analysis to answer all the three research questions.

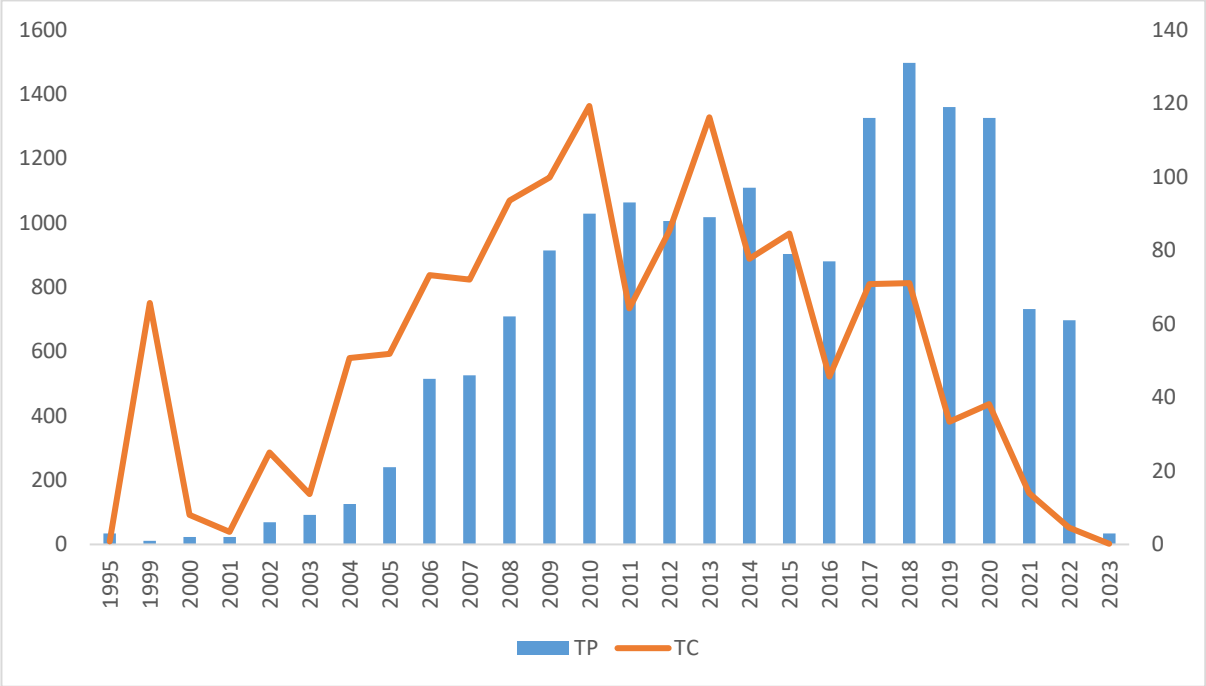
Results

Annual Publications and Citations trends (RQ 1)

In 1995, only three documents were published with 9 citations. Between 1996 and 1998, no documents were published. Starting in 2004, the number began to consistently rise into double digits, reaching its peak in 2011, 2014, and 2018, with a decline in publications during the intervals between these years. As illustrated in Figure 2, a total of 131 documents were published in 2018, the highest annual publications on IT governance so far. The number of citations reached its peak in 2010, aligning with the upward trend in publications.

Figure 2

Annual publication and citations.



Most Influential Countries (RQ 2)

Indonesia ranked first in the total number of publications with 253 documents followed by the United States, Australia, and Germany. The data was then analysed to determine which countries had the greatest number of citations. The United States was the topmost in the list with 4,595 total citations and 172 scientific productions, followed by Belgium, Germany, and Indonesia (Table 1).

Table 1

Top 10 most productive countries.

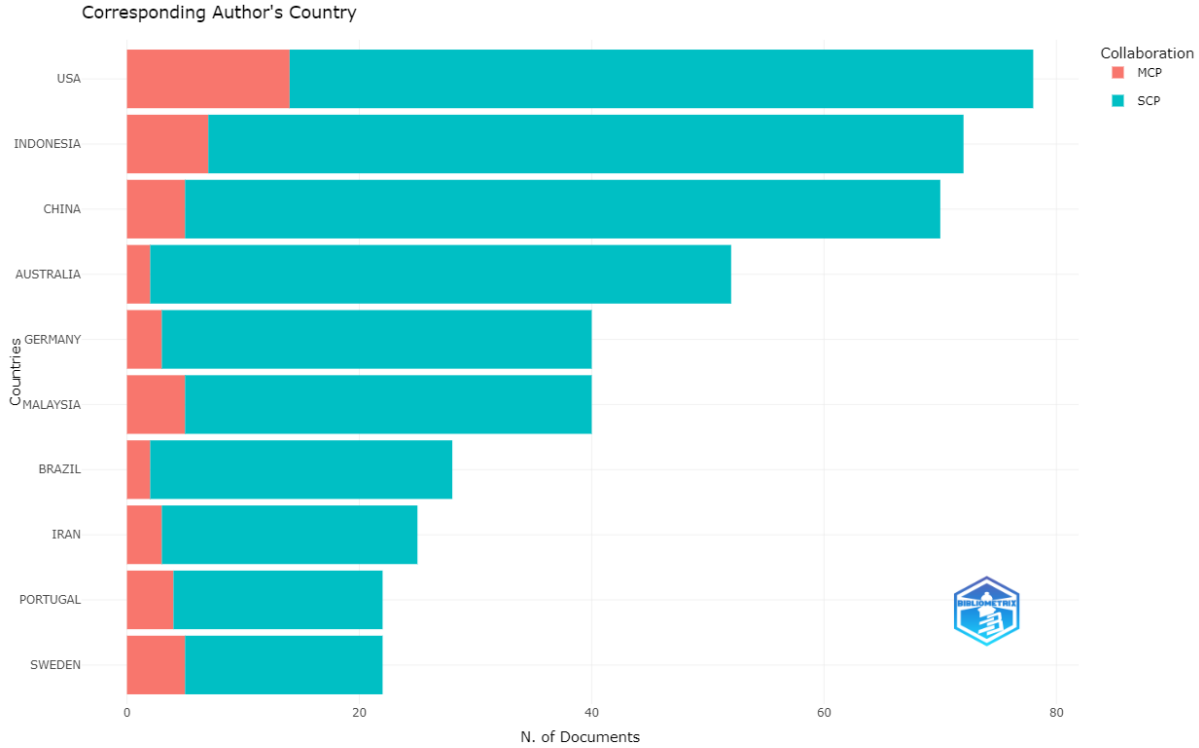
Country	TP	NCP	TC	C/P	C/CP	*h*	*g*
Indonesia	253	189	1028	4.06	5.44	12	21
United States	172	143	4595	26.72	32.13	32	65
Australia	108	85	2140	19.81	25.18	21	44
Germany	97	78	1045	10.77	13.40	16	28
Malaysia	76	60	646	8.50	10.77	13	21
Brazil	69	52	384	5.57	7.38	9	17
China	68	45	476	7.00	10.58	10	20
Portugal	59	50	486	8.24	9.72	12	18
Belgium	50	42	1086	21.72	25.86	13	32
Spain	46	37	330	7.17	8.92	9	16

Notes: TP - total number of publications; NCP - number of cited publications; TC - total citations; C/P - average citations per publication; C/CP - average citations per cited publication; *h* - h-index; and *g* - g-index.

However, in terms of corresponding author's country, the United States had the most corresponding authors with 14 multiple-country publishing (MCP) documents and 64 single-country publication (SCP) documents, followed by Indonesia with 7 MCP documents and 65 SCP documents, and China 5 MCP documents and 65 SCP documents (Figure 3).

Figure 3

Corresponding author's countries



Most Relevant Sources (RQ 2)

The most relevant sources were analysed, which reveals that the top three sources were proceedings. Among the journals, the Journal of Theoretical, and Applied Information Technology (Islamabad, Pakistan) ranked fifth with a total of 24 documents, followed by Information Systems Management (Taylor & Francis) ranked eighth with a total of 22 documents (Table 2).

Table 2

Top 10 publishing sources on IT governance research.

Source	TP	NCP	TC	C/P	C/CP	*h*	*g*
Proceedings Of the Annual Hawaii International Conference on System Sciences	67	61	1398	20.87	22.92	19	35
ACM International Conference Proceeding Series	31	22	88	2.84	4.00	5	7
Journal of Physics Conference Series	27	19	45	1.67	2.37	4	5
Lecture Notes in Business Information Processing	26	18	101	3.88	5.61	5	8
Journal of Theoretical and Applied Information Technology	24	19	132	5.50	6.95	8	10
Lecture Notes in Computer Science Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics	24	18	123	5.13	6.83	6	10
Communications in Computer and Information Science	23	18	93	4.04	5.17	6	8
Information Systems Management	22	21	1344	61.09	64.00	13	22
Procedia Computer Science	14	13	217	15.50	16.69	8	14
Advances in Intelligent Systems and Computing	13	11	31	2.38	2.82	4	4

Notes: TP - total number of publications; NCP - number of cited publications; TC - total citations; C/P - average citations per publication; C/CP - average citations per cited publication; *h* - h-index; and *g* - g-index.

Most Relevant Authors and Authors Collaboration (RQ 2)

Pereira R published the highest number of documents (22 documents) followed by De Haes, S. (21 documents), Da Silva, M.M. (19 documents), and Van Grembergen, W. (18 documents) (Table 3). Among the top authors, Van Grembergen, W. is the most impactful author (h-index of 10).

Table 3

Top 10 most productive authors, institutions, and countries

Author Name	Affiliation	TP	NCP	TC	C/P	C/CP	*h*	*g*
Pereira, R.	Iscte – Instituto Universitário de Lisboa, Department of Information Science and Technology, Lisbon, Portugal	22	21	225	10.23	10.71	9	14
De Haes, S.	Antwerp Management School, Antwerpen, Belgium	21	19	614	29.24	32.32	9	21
Da Silva, M.M.	Instituto Superior Técnico, Lisbon, Portugal	19	16	205	10.79	12.81	9	14
Van Grembergen, W.	Antwerp Management School, Antwerpen, BelgiumUniversiteit Antwerpen, Antwerpen, Belgium	18	17	983	54.61	57.82	10	18
Rusu, L.	Stockholms universitet, Department of Computer Science and Information Systems, Stockholm, Sweden	16	13	244	15.25	18.77	7	15
Green, P.	The University of Queensland Business School, Brisbane, Australia	14	13	424	30.29	32.62	9	14
Kosasi, S.	STMIK Pontianak, Indonesia	14	10	35	2.50	3.50	4	5
Almeida, R.	Universidade Federal de Sergipe, Sao Cristovao, Brazil	13	13	100	7.69	7.69	6	9
Vedyanto	Santu Petrus Junior High School, Pontianak, Indonesia	13	10	35	2.69	3.50	4	5
Bianchi, I.S.	Al Farabi Kazakh National University, Almaty, Kazakhstan	12	11	99	8.25	9.00	5	9

Notes: TP - total number of publications; NCP - number of cited publications; TC - total citations; C/P - average citations per publication; C/CP - average citations per cited publication; h - h-index; and g - g-index.

The co-authorship authors' network publishing on IT governance from 1995 to 2023 resulted in 2,771 authors. To avoid including insignificant contributions in the network map, we excluded publications with more than 25 co-authors. Figure 4a shows the collaboration linkages between the authors as lines and the clusters of collaboration as 21 different colors. In Figure 4a, a total of 83 authors met a threshold of at least 5 published articles per author. However, Figure 4b illustrates that only 12 authors from various clusters were visually connected. Although all the top 10 authors listed in Table 3 belong to different clusters, close and strong interconnections among them suggest a considerably strong research link relating to IT governance topics. For example, Pereira, R., De Haes, S., Da Silva, M.M., Van Grembergen, W., Almeida, R., and Bianchi, I.S. were strongly linked together as shown in Figure 4b.

Figure 4 a)

Co-authorship author's network

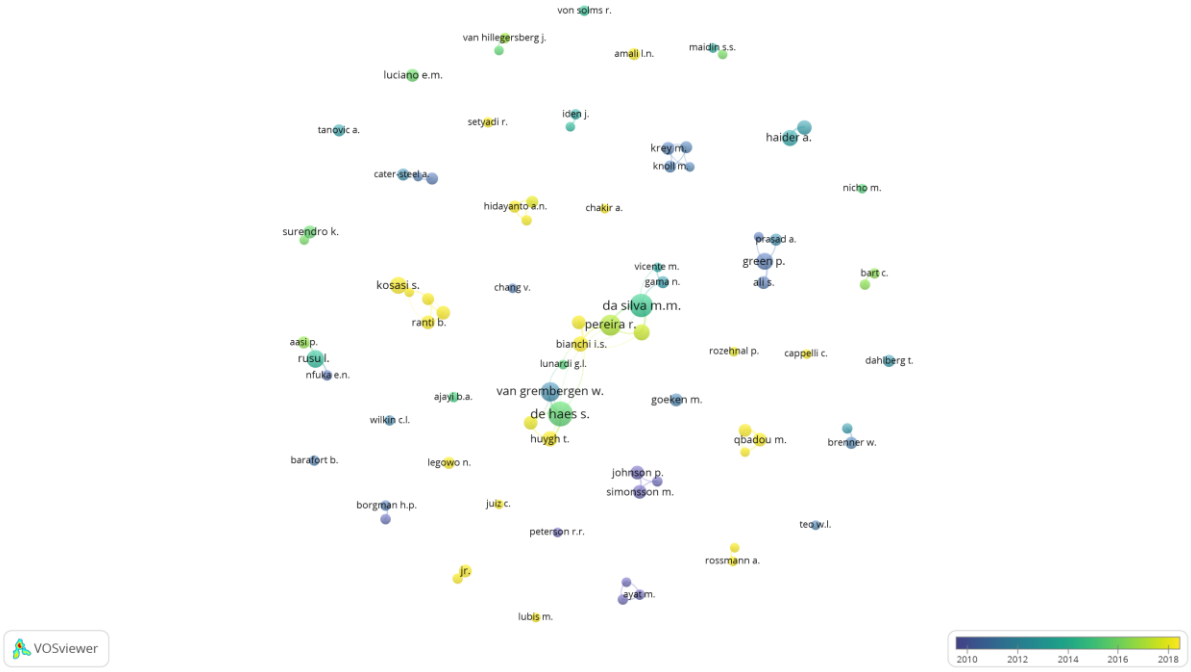
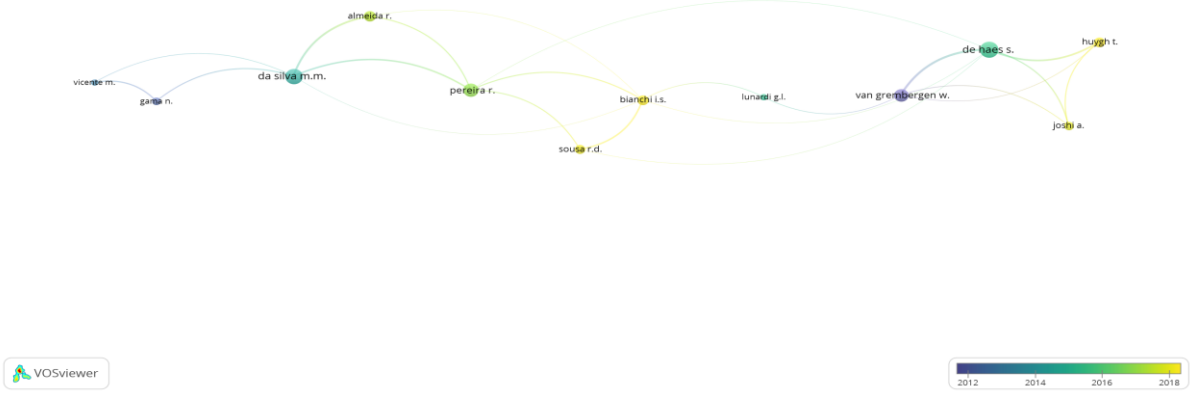


Figure 4 b)

Close-up view of the connected authors. Fractional counting with five as a minimum number of documents of an author. 83 out of 2771 authors met the threshold.



Most Frequent Keywords and Trending Topics (RQ 3)

The analysis of the co-occurrence of author keywords was done for the years 1995 to 2023, with a threshold set for at least 5 keyword occurrences. The main search terms i.e., “it governance”, “it” and “governance” keywords were excluded in this analysis. Out of 2543 keywords, 135 keywords spread in four clusters (IT management, ITIL, business-IT-alignment, COBIT) were found through analysis (Figure 5a). The most frequent keywords for each cluster were summarised in Table 4. "Cobit" has a total count of 244, followed by "itil” with a total count of 198, “itsm" with a total count of 75, and "frameworks" with a total count of 39 was the top keywords occurrence.

The overlay visualization in this study expands upon the visualization presented in Figure 5a, providing a broader perspective on the evolution of IT governance research, as demonstrated in Figure 5b. The keywords in this map with a purple-dark green color range represent IT governance-related research activities with an older average publication year, whereas the keywords in this map with a yellow color range reveal keywords used in a more recent average publishing year. It can be seen from Figure 5b that older keywords such as “compliance”, “knowledge management”, “australia”, “it organization”, “iso/iec 20000”, “it outsourcing”, and “modelling”. The research on IT governance during this period was somewhat foundational. IT governance research evolved to include keywords such as “universities”, “firm performance”, “capability level/it capabilities”, “digital transformation”, “ambidexterity”, “smart city”, “cybersecurity”, “agile”, and “cobit 5 for risk” in recent years (Figure 5b).

Figure 5 a)
Co-occurrence of author’s keywords

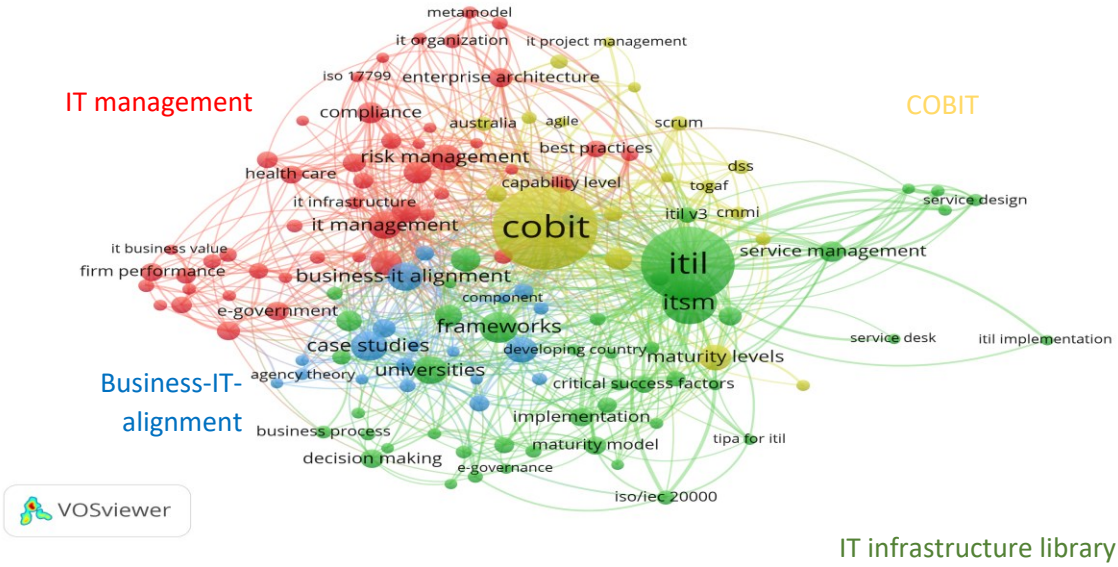


Figure 5 b)

Overlay visualization of author's keywords. Full counting with five as a minimum number of occurrences of a keyword. 137 out of 2545 authors' keywords met the threshold. Minimum size of a cluster: 15 keywords

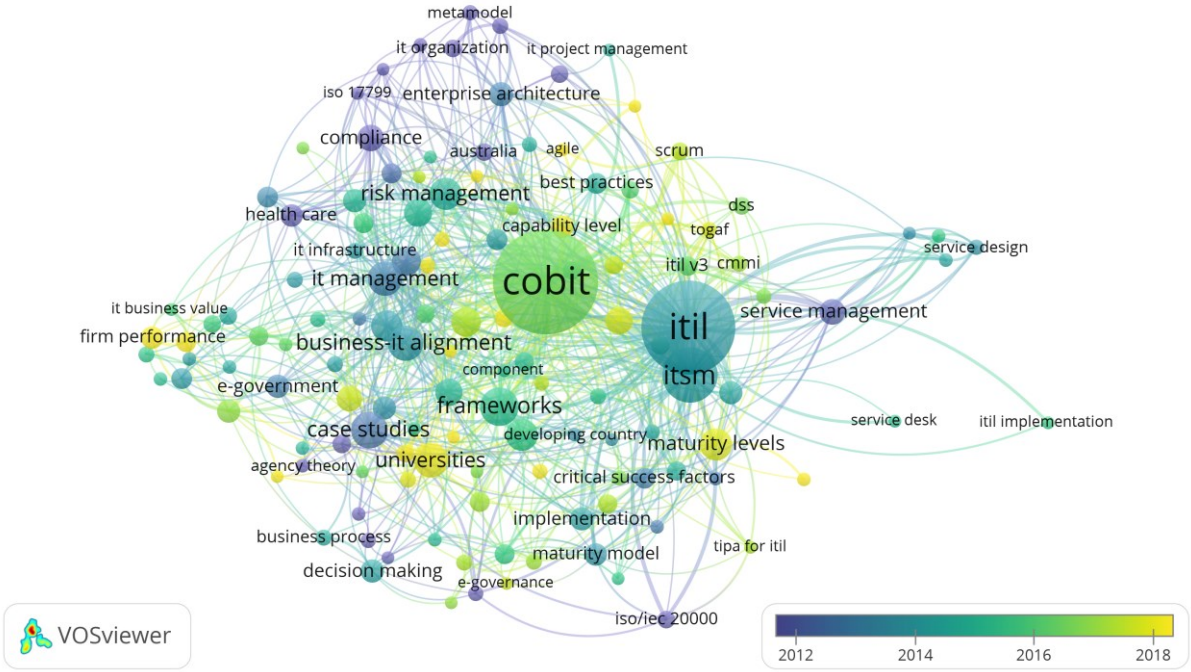


Table 4

Co-occurrence of author keywords in IT governance.

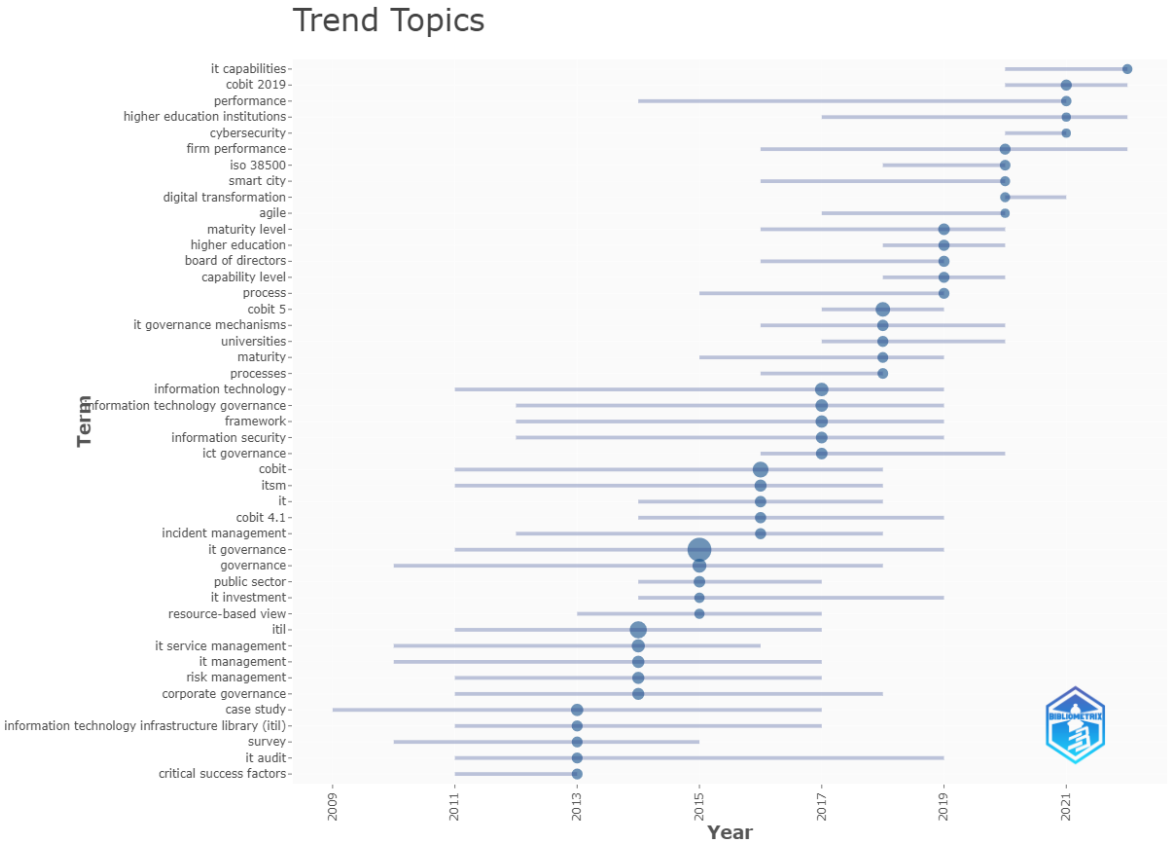
Cluster 1 (red)	Cluster 2 (green)	Cluster 3 (blue)	Cluster 4 (yellow)
IT management (31)	ITIL (198)	Case studies (36)	Cobit (244)
Risk management (28)	ITSM (75)	Business-it-alignment (33)	Maturity levels (27)
Corporate governance (26)	Frameworks (39)	Public sector (27)	ISO 38500 (20)
Strategic alignment (23)	Universities (32)	SMEs (15)	
Information security (22)	Processes (24) Information system (20)		
Compliance (19)	IT governance mechanisms (18)		
Enterprise architecture (16)	Service management (18)		
Board of directors (15)	Decision making (15)		
Cloud computing (15)	Incident management (15)		
	Implementation (15)		

Notes: The keyword occurrence is shown by the numbers in brackets.

An analysis of the data was performed to extract the trending topics from the author's keywords in the last decade (2013-2023). Interestingly, similar keywords were noted in this analysis. "It capabilities", "cobit 2019", "performance", "higher education institutions", "cybersecurity", "firm performance", "iso 38500", "smart city", "digital transformation" and "agile" were among the recent trending topics (Figure 6) matched the newer keywords seen in Figure 5b.

Figure 6

Trending topics extracted from author's keywords in the last decade (2013-2023)



Discussion

Bibliometric analysis has gained popularity as a valuable tool for uncovering trends and patterns in research studies (Mohamed Ariffin et al., 2023). By categorizing publications based on factors such as year, author, source, or country, researchers can discern patterns in the studies. This approach allows for the evaluation of publication performance and impact, as well as the potential for making predictions using metrics like the number of citations, citations per publication, the h-index, and the g-index (Qaid et al., 2021; Song & Cao, 2022). Furthermore, by considering various indicators such as co-authorship, co-citation, keyword co-occurrence, and bibliographic coupling, the current landscape of publications can be mapped and visualized to provide an overview of the state of the field (Zakaria et al., 2021).

From the retrieved data, a total of 1,510 documents, of which 745 were research articles and 28 were review articles were found. Our records extend back to 1995, and in that year only one document was published. However, between 1996 and 1998, no documents were published. From 2004 onwards the number of publications has increased to two-digit and steadily increased over time. In 2018, a total of 131 documents were published, and it was the highest number of publications per year recorded so far. The number of citations was peaked in 2010 could be due to a surge in the publication of highly impactful research papers in the field as observed between 2004 to 2010 (Weill & Ross, 2005; Tanriverdi, 2006; De Haes & Van Grembergen, 2009; Khatri & Brown, 2010; Spears & Bakri, 2010). The lower number of citations for recently published documents could be due to the short time for the publications to be recognized and cited.

Indonesia ranked first in the total number of publications followed by the United States. This trend could be explained by a sharp rise in conferences held locally in Indonesia rather than improving database coverage (Purnell, 2021). However, the United States is the topmost country in terms of total citations with 4595 citations. Similarly, in terms of the corresponding author's country, the United States ranked first with 19 MCP papers and 78 SCP documents, followed by Indonesia with 7 MCP and 65 SCP documents. It is highly understandable why the United States has the most citations and the corresponding author's country. The United States has been known to produce a high number of publications in every field of knowledge (Zakaria et al., 2021, 2022) and is the significant driving force behind the financial major scandals that occurred which would result in specific rules and legislation directly related to the area of IT governance (Dnes, 2005; Clauss et al., 2009; Ceil, 2019; Zamry & Syafinaz, 2019; Cakali, 2022).

The top sources for publishing IT governance research were found to be conference proceedings. Conference proceedings have been identified as a key part of communicating research findings in the field of computer science (Bar-Ilan, 2010, 2018). This is because conference proceedings are increasingly being indexed by major databases, and scientists may have found it advantageous to publish conference papers because they were quicker and easier to publish than journal articles or book chapters (Purnell, 2021). However, citations are directly influenced by coverage (Bar-Ilan, 2018). The number of citations per paper on average provides the most accurate comparison. Here, the situation is less obvious because, when it comes to proceedings papers, Proceedings of the Annual Hawaii International Conference on System Sciences has a C/P of 20.87, higher than some journals listed in Table 2 like the Journal of Theoretical and Applied Information Technology and Procedia Computer Science.

Van Grembergen W is the most influential author with a total of 983 citations, followed by De Haes S with a total of 614 citations, although Pereira R has slightly more documents. Both authors came from the same institution in Belgium, and they co-authored the same documents (De Haes et al., 2013a & b; Rowlands et al., 2014; De Haes & Van Grembergen, 2006, 2008a, 2008b & 2012; Joshi et al., 2018) especially the highly cited documents (De Haes & Van Grembergen, 2009; De Haes et al., 2013b). Some of the listed top authors are strongly linked together suggesting international research collaboration among them.

The keyword “cobit” has been used the most frequently in the scientific literature related to "it governance" since 1995, with 244 occurrences, followed by “itil" with 198 occurrences, "itsm" with 75 occurrences and “framework” with 39 occurrences. According to Hardy (2006), there is a significant relationship between IT governance issued by the IT Governance Institute and the COBIT (Control Objectives for Information Technology-Related) framework. This is because COBIT provides generic guidelines that an organization may use to (1) gather and process information about the organisation under control, (2) monitor the attainment of organizational goals, (3) monitor performance within each IT process, and (3) benchmark organizational achievement.

The most recent trending topics identified from the author’s keywords include "it capabilities", “cobit 2019”, “performance”, “higher education institutions”, “cybersecurity”, “firm performance”, “iso 38500”, “smart city”, “digital transformation” and “agile”. Both “cobit 2019” and “iso 38500” are the frameworks for IT governance and IT management (Visitsilp & Bhumpenpein, 2021) applied in public and private organizations including higher education institutions (Gerl et al., 2021; Lompoliu et al., 2022). However, higher education institutions and other organizations are still struggling to divide IT governance and IT management duties (Juiz et al., 2022). The most often reported challenges when implementing IT governance in higher education institutions include resistance to change and communication issues among parties, budget constraints, lack of knowledge/training for IT governance principles, and lack of vision for IT. The most often reported benefits include IT governance improves service quality, customer satisfaction, and IT planning and management alignment with university and company goals (Meçe et al., 2020). Tjong et al. (2017) largely agree that IT governance enhances performance and compliance, and IT governance benefits are similar for industry and higher education institutions.

The impact of digital technologies on our society is enormous, giving rise to various definitions. For example, "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (Vial, 2021) or "the continuously increasing interaction between digital technologies, business, and society" are some definitions that are frequently used (Van Veldhoven & Vanthienen, 2023). To quickly convert opportunities into competitive advantages in light of the profound ways that digital technologies are altering the

competitive landscape, good executive sense and awareness are required (Bonnet & Westerman, 2020). This is now essential since change and opportunity are occurring more rapidly. Agile solutions in IT governance are crucial for enterprises because digital transformation has profoundly impacted both their IT environment and organizations (Mulyana et al., 2021; Van Veldhoven & Vanthienen, 2023).

Since the pandemic, the use of digital technologies such as telecommuting, videoconferencing, personal devices, and private WiFi networks has had a positive impact on various organizations in our society (Duan et al., 2023; Singh et al., 2023). However, this change has led to an increase in cybercriminals (Cremer et al., 2022). Businesses and organizations must adopt a proactive and comprehensive approach to cybersecurity as the volume and complexity of cyberattacks increase to protect sensitive corporate and employee data, especially those charged with the responsibility of protecting information related to health, national security, and financial records, among other things (Thomas & Sule, 2022). An earlier study by Garcia-Perez et al. (2021) found that the organization board's view of a change in their cybersecurity risk climate significantly correlated with cybersecurity management capability development and investment patterns. The authors also discovered a favorable association between critical infrastructure organizations' cybersecurity training and their cybersecurity investment, notably in intellectual capital creation (Garcia-Perez et al., 2021). In another study, the authors found that each cybersecurity capability can be operationalized by a set of cybersecurity controls from various frameworks, standards, and guidelines, for example, COBIT, CIS, ISA/IEC 62443, ISO/IEC 27002 and NIST Special Publication 800-53 (Malatji et al., 2022).

In tandem with the digital transformation, the notion of "smart cities" leverages network technology to drive urban development, with cities playing an increasingly prominent role in fostering innovation across various domains, such as business, healthcare, inclusivity, and environmental sustainability (Kroes, 2010; Connolly et al., 2017). Apart from the positive impact of the smart cities concept, proper implementation of IT governance seems to be a difficult task given the possibility of irresponsible, careless, and malicious use of the data, which could have several (un)wanted side effects, including violations of legal requirements, human rights, ethical standards, and privacy and security standards (Choenni et al., 2022; Kvalvik et al., 2022).

Conclusion

The number of publications on IT governance has steadily increased over the years since 2004. Indonesia is the most productive country while the United States has been the most impactful country with IT governance publication and research collaboration. The conference proceedings publishing themes relevant to IT were the top sources of IT governance research. The themes of IT governance research include IT management, ITIL, IT alignment, and

COBIT while the recent research hotspots concentrated on "it capabilities," "cobit," "performance," "higher education institutions," "cybersecurity," "firm performance," "iso 38500," "smart city," "digital transformation," and "agile." Researchers and professionals in this field can utilize these data, which provide an informative view of the overall research trends in the field.

Several practical recommendations emerge from this context. First, it's crucial to bridge the gap between research and practice by generating actionable insights that assist institutions in navigating the challenges and opportunities presented by digital transformation. Secondly, collaboration with cybersecurity experts is essential to formulate comprehensive strategies for safeguarding data against evolving threats. Third, ethical frameworks for governing smart city data should be developed, ensuring responsible and transparent data management practices. Fourth, the adoption of agile methodologies can help organizations navigate the dynamic landscape of digital transformation by promoting flexibility and adaptability. Fifth, fostering cross-disciplinary collaborations is essential to address the multifaceted challenges posed by digital transformation, enabling a holistic and forward-looking approach to understanding its impacts. Finally, organizations should establish adaptable governance practices that effectively guide them in the ever-evolving digital ecosystem, ensuring they remain responsive to changing technological landscapes and emerging trends.

Conflict of interest

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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