A Systematic Literature Review and Bibliometric Analysis of IT Governance Disclosure in Scopus Database

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Abstract. This paper reviews the literature on a body of knowledge and analyzes the cluster trends related to IT governance disclosure. The sample includes 40 publications from the Scopus database spanning 17 years between 2005 and 2022. First, a bibliometric analysis was conducted to highlight publication growth, journals, subject areas, articles, authors, countries, and keyword co-occurrence to comprehend the scope of the established literature. Second, a literature review based on content analysis of cluster analysis was undertaken to forecast future research streams in the field. The bibliometric finding shows that IT governance disclosure covers interdisciplinary subject areas, mainly engineering and social science. The study presents five research clusters, namely (1) standard practice and national codes of disclosure of IT governance, (2) integration transparency system of IT and corporate governance, (3) causes and effects on ITG disclosure research, (4) ITG disclosure measurement, and (5) the challenges to disclosing IT-related information, where scholars are urged to expand the IT governance disclosure research. This research contributed to the growing scientific knowledge of the latest IT governance disclosure based on bibliometric analysis.

Keywords: IT Governance · Disclosure · Transparency · Bibliometric Analysis · Keyword Co-Occurrence

1 Introduction

It is important for the board to communicate to shareholders about the management of IT assets in the organization. Transparency and accountability in IT governance are crucial to foster stakeholder trust and create a positive image for the public [1]. In terms of compatibility between IT governance and corporate governance [2], corporate governance mechanisms carry over to IT governance mechanisms [3]. The board's issue with IT is IT information solely measures non-financial data [4], whereas certain stakeholders require different information for different purposes. Corporate governance's guiding principles and regulations encourage financial transparency disclosure. IT governance transparency, also known as IT-related disclosure, refers to a company's capacity to

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deliver adequate and pertinent IT governance information to organizational stakeholders in punctual and credible procedure to enable management behavior in the use of IT to be evaluated [5].

IT components are suggested to be included in the governance accountability of corporate governance, which currently only covers finance and legal compliance [6]. According to the OEDC, several nations' regulations set basic standards for disclosure and only apply to large businesses [7]. IT governance emphasizes the importance of communicating to the external stakeholders of an organization [1], and disseminating information beyond mandatory requirements is important [8, 9]. For instance, an announcement of information security activities, although not explicitly written in SOX, the significance of communication with external stakeholders raises market value by more than 6% [10]. Disclosure of IT investments can be advantageous for both investors and businesses because it can reduce the uncertainty of the company's performance and possibly raise the value in the market as indicated by the reaction of the stock market [11–13]. Despite the delay between the time that IT investments are made and the time that the benefits are realized in the financial statements [14]. ITG disclosure has a favorable impact on business performance [15–17]. However, transparency is also recognized as an important mechanism for ensuring good governance, but little attention is paid to the issue of transparency in IT governance [5]. Accordingly, this study intends to address the following research questions (RQ):

- RQ1: What are the growth and the impact of the publication on IT governance disclosure?
- RQ2: What are the reputable quality sources of this domain?
- RQ3. Which are the most influential articles (MIA) in this research domain?
- RQ4: Who are the leading, influential, and impactful authors contributing to this domain? and where do authors affiliate and their origin country?
- RQ5: What are the keywords and keywords co-occurrence networks?
- RQ6. What is the trend of publications in IT governance disclosure studies?

Answering the questions above, this study uses the bibliometric analysis and a systematic literature review. This leads to the suggestion based on cluster analysis, a broader perspective of IT governance disclosure and a starting point for future research on this topic.

This paper is organized as follows: Sect. 2 provides research method and data collection, Sect. 3 presents the results of descriptive bibliometric analyses and cluster analyses, Sect. 4 discussion and suggests future research developments and the final Sect. 5 concludes the paper.

2 Method

2.1 Research Method

The systematic literature reviews and bibliometric analysis were the foundation of our investigation. Numerous research has proven the efficacy of combining these two complementing techniques [18–20]. The depth and breadth of the analysis are satisfied by the simultaneous complementarity of all approaches [20]. A quantitative analysis research

technique known as bibliometric analysis reviews the bibliometric and intellectual structure of a body of literature. This technique shows structural interactions between research elements in the particular domain, likely authors, origin countries, and institutions, as well as journals [21]. Additionally, the processes used for the bibliometric analysis is scientifically replicable, and transparent, demonstrating the capacity to reduce subjective issues [22–25]. Figure 1 summarizes the research methodology and findings. In this research, the approach that was replicated from previous research was carried out as follows, (i) research design, (ii) data collection, (iii) data analysis, (iv) data visualization, and (v) interpretation [23].

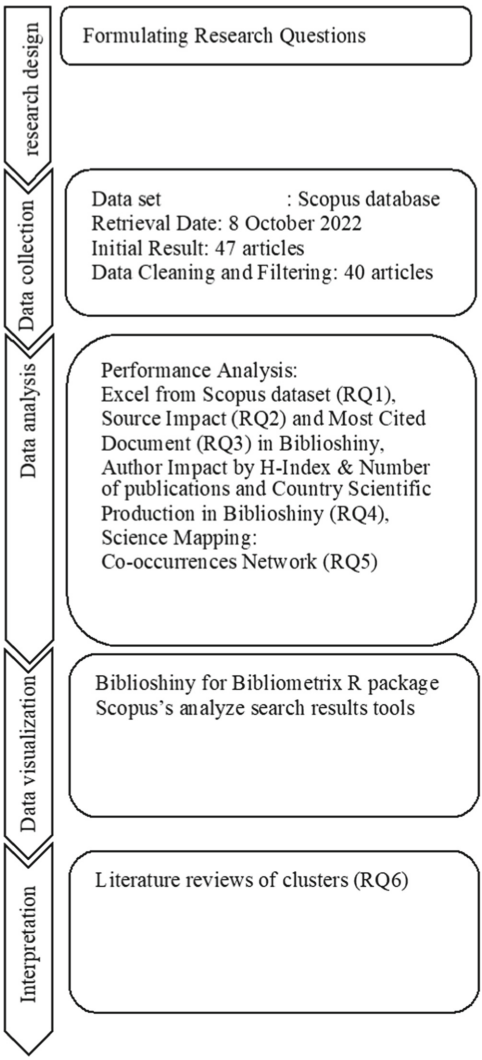

Fig. 1. Methodological procedures.

2.2 Research Data Collection

The Scopus database was used as the main data source. It is a primary citation source and comprehensive repository for papers published in scholarly publications [23, 26]. The sample was selected from Scopus using the following criteria:

- These terms ("IT governance" OR "information technology governance") AND (disclosure OR transparency) were used to identify all published articles with any of the keywords in the title, abstract, or author keywords retrieved for further examination. Defining the term or phrase is a crucial strategy for locating keywords for a thorough literature search [23]. The terms IT governance transparency or IT governance disclosure are used interchangeably [5]. In order to identify a wide variety of topics and include several contributions from various research streams, general keywords were chosen in this study to produce an all-encompassing and integrated view of IT governance (ITG) disclosure.
- The search was restricted to journal articles and conference proceedings to enhance the reliability of the results. The quality assurance process for these publication outlets is well-recognized because the published articles passed the rigor of the peer-review process, and it used citations standard [22, 23, 26].
- Due to the larger global readership of this language, this analysis was restricted to English-language publications.

For further research, 47 articles were found using the search as mentioned earlier parameters, and after removing 7 uncompleted articles' metadata, a total of 40 articles were used for further analysis (See Table 1).

Table 1. Search results from Scopus database.

Step	Filtering criteria	Query on Scopus	Documents count
1	Initial search result (on search term)	(TITLE-ABS-KEY ("it governance" OR "information technology governance") AND TITLE-ABS-KEY (disclosure OR transparency))	56
2	Source type (journal and conference proceeding)	AND (LIMIT-TO (SRCTYPE, "p") OR LIMIT-TO (SRCTYPE, "j"))	50
3	Language filter (English)	AND (LIMIT-TO (LANGUAGE, "English"))	47
4	Metadata completeness	Manual filters remove 7	40

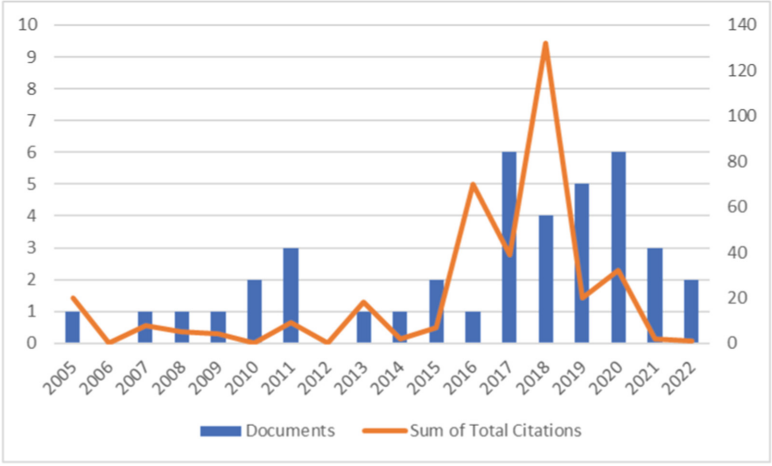

Fig. 2. Annual scientific production and total citations of IT governance disclosure between 2005 and 2022.

3 Result

3.1 Growth of Publications

The distribution of document numbers on an annual basis reflects research trends. The number of publications is an indicator of the level of interest in a topic [23]. Figure 2 illustrates the number of publications and the sum of total citations obtained from the Scopus database. Although not limited by year in the data collection criteria, the Scopus data shows the first occurrence of articles in this database back in 2005. The number of studies is still limited and the number of publications per year still varies. Both matrices, article production per year and citation, indicate that the citation rate is increasing significantly more quickly than the pace of publication. Despite the varying volume of published research documents on ITG Disclosure, the total citation trend flourishes indicating a growing interest in this domain mainly in Computer Science (see Fig. 3).

3.2 The Most Influential Sources

Based on Table 2, highlights the top ten sources of ITG Disclosure based on H-index source impact in Biblioshiny for Bibliometrix. Influential and impactful sources indicated by source indexation like h-index, g-index, and m-index, indicate their quality. The Journal of Information Systems is on top of the list on both the h-index and total citations, which contributes 4 publications (about 8.5%) to this review. Followed by the Proceedings of HICSS identified by the number of publications of 3 articles and 16 citations.

3.3 The Most Influential Articles

The citation analysis method was used to study influential publications by the number of citations obtained. This indicates the intellectual relationships among publications

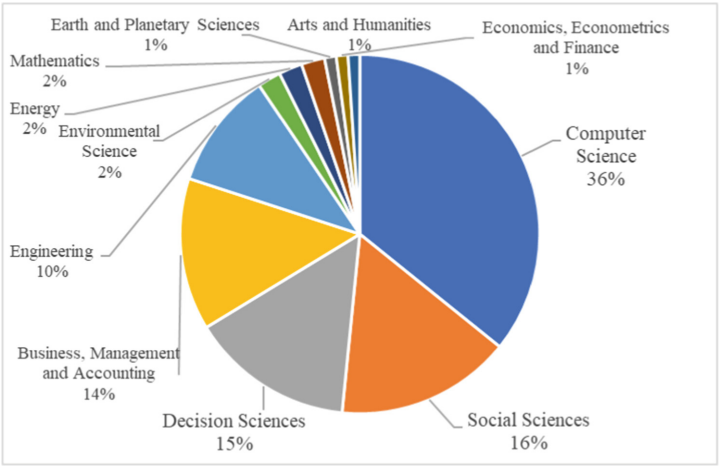

Fig. 3. Documents by subject area.

Table 2. Top-10 journal/ conference proceedings source impact by h-index.

Source	Publisher	h	g	m	TC	NP
Journal of Information Systems	American Accounting Association	3	4	0.43	94	4
Proceedings of The Annual Hawaii International Conference on System Sciences (HICSS)	IEEE Computer Society	3	3	0.19	16	3
Information Systems Management	Taylor & Francis	2	2	0.20	23	2
International Journal of Project Management	Elsevier	1	1	0.20	56	1
Information and Management	Elsevier	1	1	0.20	41	1
Journal of Accounting and Public Policy	Elsevier	1	1	0.20	27	1
Cogent Business and Management	Cogent OA	1	1	0.33	22	1
Information Systems Security	Taylor & Francis	1	1	0.06	20	1
Proceedings - 2017 IEEE 6Th International Congress on Big Data, Bigdata Congress 2017	IEEE Computer Society	1	1	0.17	13	1
Vine Journal of Information and Knowledge Management Systems	Emerald	1	1	0.20	8	1

Notes: h = h index, g = g index, m = m index, TC = Total Citation, NP = Number of Publications

that were cited by other publications [21]. Among the highly cited references in Table 3, a recent article from 2016 received the spotlight with a total citation of 70 which entitled "The Relationship Between Board-Level Technology Committees and Reported

Security Breaches" [27]. This article available in the Journal of Information Systems was identified as the most influential source, along with the other two publications by Vincent et al. [28, 29].

Table 3. Top-10 influential articles journal/ by total citation.

Title/ Author(s)	Source/ DOI	Year	TC
The relationship between board-level technology committees and reported security breaches/ [27]	Journal of Information Systems/ https://doi.org/10.2308/isys-51402	2016	70
Relationships between project governance and information technology governance and their impact on project performance/ [30]	International Journal of Project Management/ https://doi.org/10.1016/j.ijproman.2017.10.003	2018	56
Explaining IT governance disclosure through the constructs of IT governance maturity and IT strategic role/ [31]	Information and Management/ https://doi.org/10.1016/j.im.2017.09.003	2018	41
Cybersecurity awareness and market valuations/ [32]	Journal of Accounting and Public Policy/ https://doi.org/10.1016/j.jaccpubpol.2018.10.003	2018	27
Improving service quality, accountability and transparency of local government: The intervening role of information technology governance/ [33]	Cogent Business and Management/ https://doi.org/10.1080/23311975.2020.1735690	2020	22
Sarbanes—oxley and enterprise security: IT governance — what it takes to get the job done/ [34]	Information Systems Security/ https://doi.org/10.1201/1086.1065898X/45654.14.5.20051101/91010.4	2005	20
An empirical assessment of IT governance transparency: Evidence from commercial banking/ [5]	Information Systems Management/ https://doi.org/10.1080/10580530.2013.773805	2013	18
Data governance framework for big data implementation with a case of Korea/ [35]	Proceedings - 2017 IEEE 6th International Congress on Big Data, Big Data Congress 2017/ https://doi.org/10.1109/BigDataCongress.2017.56	2017	13
IT governance and the maturity of IT risk management practices/ [28]	Journal of Information Systems/ https://doi.org/10.2308/isys-51365	2017	12
Board and management-level factors affecting the maturity of IT risk management practices/ [29]	Journal of Information Systems/ https://doi.org/10.2308/isys-52229	2019	9

Notes: DOI = Digital Object Identifier, TC = Total Citation

Table 4. Top-10 contributing authors and affiliation.

Author	TC	NP	Affiliations	Country
Joshi A	71	5	Maastricht University	Netherlands
De Haes S	53	4	University of Antwerp	Belgium
Higgs JL	91	3	Florida Atlantic University	United States
Huygh T	12	3	University of Antwerp	Belgium
Pinsker RE	94	4	Florida Atlantic University	United States
Bollen L	59	2	Maastricht University	Netherlands
Hassink H	59	2	Maastricht University	Netherlands
Luciano EM	7	2	Pontifical Catholic University of Rio Grande do Sul	Brazil
Van Grembergen W	44	2	University of Antwerp	Belgium
Vincent NE	21	2	The University of Tennessee at Chattanooga	United States

Notes: TC = Total Citation, NP = Number of Publications

3.4 Analysis of Main Authors and Origin Country

The list of the top 10 most contributing authors was arranged in descending order by the number of publications (NP) shown in Table 4. Joshi A is an impactful author in the ITG disclosure domain with 5 publications and 4 h-index. The author's influence is represented by citation [21]. Pinsker RE is the most influential author (TC = 94, NP = 4, h_index = 3) who is affiliated with Florida Atlantic University, United States.

This research domain was dispersed in several organizations located in the US, Indonesia, Belgium, Brazil, and Netherlands respectively 29, 16, 11, 11, and 9 frequencies of occurrence in publications. Based on Fig. 4, depicts the country's scientific production. The publication of articles in various origin countries reflects the importance and influence of the country in the ITG disclosure domain. Most relevant affiliations were from different continents including Europe with the major contribution (37%), followed by America (16%), Asia (15%), and Australia (12%). The following affiliates have linkages to the most articles from each continent namely Maastricht University in Europe (NP = 7), The University of Melbourne in Australia (NP = 3), Universitas Muhammadiyah Yogyakarta in Asia (NP = 2), and Bentley University in America (NP = 3).

3.5 Co-occurrences of Keywords

The co-occurrence of terms forms clusters. This assumes that terms that occur repeatedly together exhibit a thematic relationship. The co-occurrence of keywords analysis is accustomed to forecast future research in the field [21]. The terms extract from "author keywords", "article titles", "abstracts", and "keyword plus". Keyword Plus is an effective keyword for bibliometric analysis. Keywords Plus is words or phrases generated

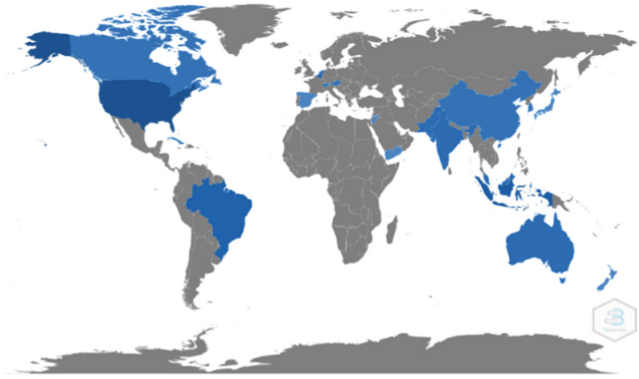

Fig. 4. Country scientific production.

automatically from the titles of cited articles, thus limiting biases and risks associated with the manual tagging of content [20]. The correlation between two terms is shown by lines; the more frequently two terms appear together, the stronger the line between them is. A term is depicted by a node (circle) which diameter indicates the number of links that the keyword has, and their color reflects the cluster they belong to. Co-occurrence of keywords identified and visualized via Biblioshiny for Bibliometrix, and the terms in this analysis extracted from keyword plus for the analysis. "IT governance", "transparency", "information system", and "information technology governance" have a significant degree of association with other keywords reflecting their central role in the study.

Keywords co-occurrence shown in Fig. 5 resulted in five major clusters of various keywords listed in Table 5. This cluster indicates similar research focus marked by distinct colors for each cluster.

- Cluster 1 (red) centered on the establishment of standard practice and a national code to put attentiveness to disclosing IT governance.
- Cluster 2 (blue) stressed the IT governance framework and standards that meet the requirements of corporate governance.
- Cluster 3 (green) emphasized the information reflected in IT governance outcomes particularly causes and consequences.
- Cluster 4 (purple) focused on the IT governance performance or effectiveness measurement as an important component in establishing transparency desired by stakeholders on how well IT risk was managed.
- Finally, cluster 5 (yellow) pointed to the response to internal and external challenges through information technology transformation to accelerate its bureaucratic settings and new methods seeking collaboration, and transparency.

Keywords are beneficial to discover popular research topics among researchers and they have been shown to be crucial to the advancement of science [19]. Considering the network map, "IT governance" was the most prominent keyword with the highest betweenness centrality of 263.45. In other words, the keyword link between research clusters in this field [36]. "IT governance" (blue node) was linked to another cluster through keywords listed in Table 5 with the asterisk symbols. It can be seen in Fig. 5,

Table 5. Clusters from the co-occurrence of keywords analysis.

Cluster	Keywords
1 (Red)	Transparency*, industrial management*, IT strategic roles, corporate governance codes, ownership structure, and annual reports.
2 (Blue)	IT governance*, content analysis, corporate governance*, governance mechanisms, information science, societies and institutions, decision making, human resource management, and network security.
3 (Green)	Information systems*, information technology governance*, COBIT, disclosure, surveys, public policy, information use, and organizational goals.
4 (purple)	Risk assessment*, benchmarking, key performance, indicators, risk management*, performance measurements, and electronic commerce.
5 (yellow)	Information management, and personnel.

Notes: * = betweenness centrality

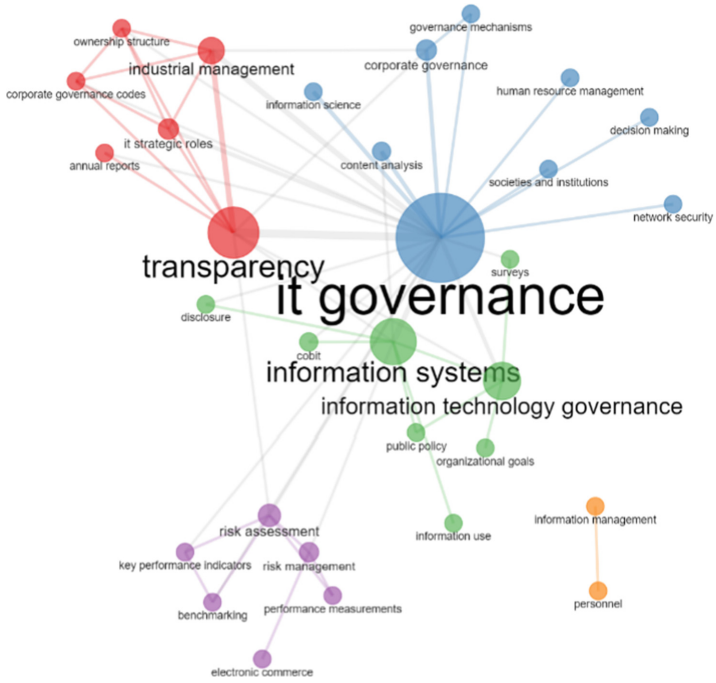

Fig. 5. Network visualization of keywords co-occurrence.

that four clusters are connected to each other except cluster 5 (yellow). Although articles in cluster 5 discussed IT governance but betweenness centrality on the keywords in this cluster indicated zero.

3.6 Cluster Analysis

This subsection presents the findings of the systematic literature review, which was based on the most influential article in each cluster. As stated in the earlier subsection, five clusters were identified based on the Scopus search for the term and Biblioshiny for Bibliometrix for keywords co-occurrence. In-depth content analysis of the papers through reading was done and deduced specific considerations based on streams of research.

Cluster 1 (Red). The growing concern about disclosing IT governance drives organizations to comply with standard practice and national codes. Thus, the cluster discussed these issues. Providing stakeholder transparency in governing IT is a crucial concern for organizations due to pressure for compliance with regulations and legal requirements. Boards have to make sure that IT governance is disclosed according to standard requirements. Corporate governance codes provide guidance on how to release IT-related information to the public. For instance, the South African corporate governance code covers a significant amount of the substance of IT governance [37], and financial reporting standard for Financial Reporting Quality (FRQ) [38].

IT (governance) elements were explicitly mentioned in 15 corporate governance codes from 15 countries [37]. To analyze IT governance content, the study employed the IT governance disclosure (ITGD) framework by Joshi et al. [5]. King Code III of Governance for South Africa contains specific IT (governance)-related guidance, while the Belgian code Lippens does not [9] neither do the rest of the 13 countries [37].

Belgian firms tend to nondisclosure of ITG content, the insightful finding derived from the exploratory research on IT governance transparency. Given the same degree of IT usage intensity, listed companies were more likely to be attentive in disclosing their IT governance than unlisted companies [3].

On the other hand, Southern Brazil's companies enforced corporate governance and sustainability of companies issues by ensuring an ethical standard of organizational control to improve information quality and organizational transparency [39]. Compliance with standards of corporate governance, IT governance, and ITA/EA (Information Technology Architecture/ Enterprise Architecture) lead to the proposal of the Framework of Big Data Governance in South Korea [35].

Cluster 2 (Blue). Cluster 2 (blue) stressed the framework and standard for IT governance that can meet the requirements of corporate governance. To communicate pertinent IT information to external stakeholders, a stronger financial reporting and transparency method is required. The companies must adhere to the governance mechanisms in order to actively report the content of IT information. By considering the Enron Inc. Case, companies place more emphasis on the management, control, and measurement of information systems including information-related risks, and IT resources investment (Nicho dan Cusack 2007). Several sections of the Sarbanes Oxley Act (SOX) of 2002 and the Turnbull Guidance in the United Kingdom provided the further incentive to the governance of the IT organization [34, 40].

The two categories of governance mechanisms namely IT governance and IT executive incentive alignment impacted on the disclosure of IT control weaknesses [41]. The role of the IT governance mechanism is related to the presence of audit and IT experts

within corporate governance committee members, as well as IT executives with higher levels of structural and technical authority. The result indicated that IT governance mechanisms presumably conceal flaws in IT control weaknesses. In regards to IT executive incentive alignment mechanisms, the wider the salary gap between IT executives and business executives in the top management team is more likely for disclosing IT control weaknesses.

Implementation of governance mechanisms is not without problems, for example timeliness to disclose form 8-K [42]. A Form 8-K is a report filed with the SEC to announce a significant event that contains important information to shareholders, such as an acquisition, bankruptcy, director resignation, or change in fiscal year. This lead to the potential positive impact on the timeliness of form 8-K. The finding showed IT-expert CEOs and IT expertise on the board promote efficient IT use and are related to timely manner information disclosure [42].

Additionally, the content analysis method has been used in IT governance research, although it is still in its infancy. A study used content analysis to formulate 48 indicators that match the descriptions. This metric is used to measure the effectiveness of ITG [43]. On the other hand, a content analysis of annual reports was used to determine the level of ITG disclosure by organizations. The findings of the study suggested improvement in reporting relevant IT information to stakeholders [31].

Cluster 3 (Green). The causes and consequence of ITG disclosure practice represents a set of keywords in this cluster. Various effects of ITG disclosure identified by articles in this cluster, namely project performance and abnormal stock returns. The best use of ITG disclosure practice is affected by corporate governance practices, IT governance maturity, and cybersecurity governance.

IT governance and project governance included in the operational strategy, contributed to the project's accomplishment. According to the results of a survey of 282 professional employees from various industries, both IT governance and project governance contributed to enhancing project performance. Disclosure and reporting as metrics to measure project governance strengthen project performance positively, along with other metrics such as portfolio direction, project sponsorship, and project effectiveness and efficiency. This finding indicates a collaborative strategy between IT governance and project governance in improving project performance [30].

Further, the IT security breach disclosure report was useful to a wider stakeholder through return analysis. The result of security breach reports between 2005 and 2014 investigations revealed that the likelihood of reported breaches in a given year is higher for companies with technology committees than for those without one. The firm's IT governance represented by a board-level technology committee reported IT security breaches to signal the firm's ability to detect and respond to security breaches and eventually strengthen its performance in terms of the negative abnormal stock returns [27].

Previously discussed disclosing IT information contributed to the performance level in both project scope and market scope. Conversely, ITG disclosure is the result of previous actions. The corporate governance practices were favorably correlated with the degree of ITG disclosure [5]. Using Joshi's et al. self-developed IT governance disclosure (ITGD) framework, the ITGD index enabled stakeholders to differentiate which

companies have better IT governance than others. The authors made the case that firms with relatively good corporate governance practices take the issue of IT performance measurement very seriously when informing and communicating with shareholders.

The interaction between the maturity processes and the disclosure of IT governance was examined [31]. The findings, which were based on a content analysis of annual reports and a field survey on the maturity of COBIT process, showed that the framework of IT governance promoted accountability and transparency by enhancing external reporting of essential IT information to external stakeholders, especially in environments where IT plays a significant strategic role. In the same vein, improvement levels of organizational transparency, their reputational, financial, and accountability depended directly on the maturity levels of information technology processes including IT strategic plans and quality management, IT risk, and project management. Intriguingly the authors used data mining techniques to analyze the 37 processes of the COBIT framework in 285 companies in southern Brazil [39].

Cybersecurity is part of the board's responsibility; thus, the level of companies' cybersecurity reflects the board's action in handling cyber threats and challenges. Likewise, the cybersecurity governance affected the level of cybersecurity disclosure significantly. This demonstrated the significance of selecting board members with IT expertise and experience, since doing so leads to optimized decision-making when cyber threats and issues arise [44].

Contradicting Joshi's et al. [5] findings, corporate governance mechanisms had a counterproductive effect on business continuity, transparency and disclosure [45]. A total sample of 232 respondents from board of directors members, senior executives, auditors, IT professionals, and other practitioners represented multiple sector companies during the pandemic of Covid-19 in Jordan. The result showed IT governance fully mediates the relationship between corporate governance mechanisms and business continuity, and transparency and disclosure [45]. To put it another way, IT governance shields the company from harm during any crisis.

Cluster 4 (Purple). The fourth cluster emphasized measuring the performance or effectiveness of IT governance as a key factor in achieving the transparency desired by stakeholders as regards how well IT risk was mitigated. Risk in information technology-related aspects is an extremely important variable for ITG disclosure, particularly the risk associated with information. The information is classified into different types including private, confidential, internal, or public. Although there are various causes of IT risk, the company's information at risk could cause severe loss. For instance, organizations are exposed to the risk of unintentional disclosure of information caused by the theft of computing devices [46]. Even worse, firms are becoming more vulnerable to the compromise of customer information as a result of information breaches. This incident has the potential to expose confidential or protected information [28].

The boards of directors and management were called upon to be deeply involved in Information Technology (IT) risk management practices. Companies that fall under the jurisdictional requirements of the US Securities and Exchange Commission (SEC) are required to improve proxy disclosure information and better reporting. Board involvement in risk management can be embroiled in the capacity of an oversight role [28, 29]. The boards gave a high priority to the oversight of IT risk by creating a committee

of technology at the board level as part of the firm's IT governance. This committee indicates the capability of the firm to distinguish and take action to security breaches [27].

These aspects highlight the necessity of measuring the efficiency or performance of information systems. The Chief Information Officer's (CIO) reporting structure and the CEO duality affected the maturity of IT risk management practices [28]. A survey was distributed to high-level IT professionals who measured strategic and operational maturity in the context of IT risk management. The result found that direct reporting practice from CIO to CEO strengthens strategic IT risk management, and relatedly operational IT risk management showed the same result. Additionally, public companies in particular had more mature IT risk management practices when the CEO duality was present. The authors argued that since executive management may have distorted access to the board, knowledge of the reporting structure provided insight into how well IT risks were being managed and the factors impacting IT governance.

Meanwhile, a metric was developed to measure ITG effectiveness based on interviews and focus group discussions consisting of 45 companies [43]. The necessity of ITG effectiveness measurement, in terms of its contributions to the improved transparency and IT accountability needed by stakeholders [43]. IT governance standards such as COBIT were employed to assess the IT usage in the higher education institution [47]. The result of the COBIT framework measurement helped to identify the deployment of IT that was aligned with organizational goals. The result showed three out of five of the Evaluate-Direct-Monitor (EDM) aspects at the highest level namely Ensure Benefits Delivery (EDM02), Ensure Resource Optimization (EDM04), and Stakeholder Transparency (EDM05). On the other hand, domain Ensure Governance Setting and Maintenance (EDM01), and Ensure Risk Optimization (EDM03) needed to be improved.

Cluster 5 (Yellow). Information management focuses on issues relevant to public information. Both internal [48] and external [49] problems can arise and remain a problematic challenge. The underperformance of Information System/Information Technology (IS/IT) issue caused by a large number of IS applications with identical functions, dispersed infrastructure, and inadequate IT governance [48]. The Strategic IS Planning (SISP) was used to leverage Information System/Information Technology (IS/IT) to improve bureaucratic procedures in the Ministry of Energy and Mineral Resources (MEMR). In the formulation of SISP, three business principles—automation, continuity, and standardization— were utilized. The SISP was used as a formal development guideline for IT roles, technical strategies, and policies in the four layers of IT governance, IS application, IT infrastructure, and IT human resources. The authors argued that SISP implementation can transform the bureaucracy through IS/IT which ultimately enhances business legalization procedures, transparency performance, and open-access public data standardization.

It was problematic for large enterprises to maintain their flexibility and responsiveness while providing the best support for the current operations and goals in an unstable and turbulent environment [49]. Numerous IT trends and developments such as IT enablement, IT governance, IT management, and IT workforce put pressure on transforming the business. The Department of Defense (DoD) sought new ways to share information, collaborate, be transparent, and have on-demand capabilities through IT

transformation. The authors examined adoption of Enterprise 2.0 technologies across the Department of Defense (DoD) to face those challenges.

4 Discussion

This review highlights the growing body of scholarly literature and the impact of information technology (IT) governance disclosure research, discussed in interdisciplinary subject areas. The majority of research subjects fall under the engineering category (e.g., computer science and engineering), as well as social science and humanities (e.g., decision science, social science, business, management, and accounting). Theoretically, these two areas are inseparable since successful IT governance depends on the alignment of both IT and businesses in managing IT resources. The primary regional contributors to publications are from Europe and America. Interestingly, South Africa is the nation with the significant contain of IT (governance)-related guidelines in its national corporate governance code. Thus, future researchers will have the opportunity to collaborate with prospective researchers due to the worldwide diversity of regions and affiliations and develop studies in the current national corporate governance code level in creating an IT governance environment through disclosing companies' IT-related information.

Based on the existing literature from the Scopus database, the initial publication dated back to the 2000s. ITG disclosure research is still in the emerging stage, and future research needs to be further developed. The presence of five primary streams has been highlighted using content analysis as a suggestion for future research.

The first issue is related to standard practice and national codes of ITG disclosure. An ITG disclosure standard is important to ensure that companies provide consistent and coherent information to make the judgment more dependable and accurate. Currently, an IT governance disclosure (ITGD) framework [5] was used to evaluate fifteen countries' corporate governance codes. Thus, this measurement can be extended to other countries to assess corporate governance codes and other standards that are the reference for ITG disclosure. A better understanding of a standard code of ITG disclosure applied to companies operating in a certain country might contribute to better information quality and organizational transparency in managing their IT resources.

Second, research on an integrated corporate governance system for ITG disclosure. Meeting the needs of external stakeholders, including IT information, requires the involvement of IT and corporate governance. However, although IT investments come at a cost and there are consequent IT risks, reporting IT-related information is not mandatorily applied in all countries. In the future, improved external reporting of relevant IT information, including financial and non-financial transparency, to meet corporate governance requirements. Enhance the quality of reporting and transparency of IT information to meet the needs of corporate governance oversight in a timely manner.

The third topic is ITG disclosure research's causes and effects. Overall, there are three antecedents for ITG disclosure, including corporate governance practices, the maturity of IT governance processes, and cybersecurity governance, as well as two outcomes, including project performance and abnormal stock returns. Observed that the 40 papers had only a small number of data points to establish causes and effects on the study. By adding more database sources and targeted keywords for analysis, it would be beneficial

to create a conceptual model that integrates the cause and effect of ITG disclosure in the future study. The relationship between ITG disclosure and other variables can be followed up and taken into account in empirical study.

ITG disclosure measurement was covered in the fourth research stream. The efficacy of IT use within the organization and the quality of IT performance can both be indirectly measured by evaluating ITG transparency. Stakeholders use this metric to assess the IT risk to mitigate what might occur in the business environment. Future researchers are suggested a thorough evaluation of ITG disclosure by taking potential IT risks into account. Additionally, to confirm the validity of the suggested measurement instrument and to compare the results based on context and research location, future studies can assess the ITG disclosure using the framework created by earlier researchers.

Finally, the fifth issue is the challenges to disclosing IT-related information. So far, the management of IT in several organizations is still problematic, starting from the availability of IT, the utilization of IT usage, and the mismatch between the availability of IT and the needs of the organization. In addition, challenges from outside the company to win the market in the digital era, and environmental instability both in terms of market and technology. Subsequent research can examine IT adoption which previously identified Process Business Reengineering (PBR).

5 Conclusion

In sum, this paper demonstrated that bibliometric analysis of IT governance disclosure provides a clustered research stream based on journal articles available on the Scopus database. A total of 47 publications were identified in the initial result, and 40 publications were used for further analysis in this study. Biblioshiny for Bibliometrix R package and Scopus's analyze search results tools were utilized to visualize data.

This study leads to the conclusion upon answering research questions. The first publication was made in the 2000s, according to the currently available literature from the Scopus database. ITG's disclosure research is still in its early phases, therefore multidisciplinary research is still needed. The scientific articles were published in reputable journals and conference proceedings such as the Journal of Information Systems, Proceedings of The Annual Hawaii International Conference on System Sciences, Information Systems Management, International Journal of Project Management, and Information and Management. Higgs et al. [27] contributed to the Top-10 influential articles journal by total citation, and also listed as influential authors. Higgs JL together with Joshi A, De Haes S, Huygh T, and Pinsker RE is an impactful author in the ITG disclosure domain. These authors come from a diversity of regions and affiliations; this encourages the opportunity to make a worldwide collaboration with prospective researchers. The five-research cluster is identified based on the keywords that frequently occur together. The clusters namely (1) standard practice and national codes of disclosing IT governance, (2) integration transparency system of IT and corporate governance, (3) causes

and effects on ITG disclosure research, (4) ITG disclosure measurement, and (5) the challenges to disclosing IT-related information reflects their central role in the study.

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References

1. Raghupathi, W.R.: Corporate governance of IT: A framework for development. Communications of the ACM 50(8), 94-99 (2007).
2. Weill, P., Ross, J.W.: IT governance: How top performers manage IT decision rights for superior results. Harvard Business Press, Boston (2004).
3. De Haes, S., Huygh, T., Joshi, A.: Exploring the contemporary state of information technology governance transparency in Belgian firms. Information Systems Management 34(1), 20-37 (2017).
4. Musson, D., Jordan, E.: The broken link: Corporate governance and information technology. Australian Accounting Review 15(3), 11 (2005).
5. Joshi, A., Bollen, L., Hassink, H.: An empirical assessment of IT governance transparency: Evidence from commercial banking. Information Systems Management 30(2), 116-136 (2013).
6. De Haes, S., Joshi, A., Huygh, T., Jansen, S.: How boards realise IT governance transparency: A study into current practice of the COBIT EDM05 process. ISACA Journal 3, 1-5 (2016).
7. OEDC.: Recommendation of the Council on Principles of Corporate Governance. OEDC, Paris (2022).
8. Healy, P.M., Palepu, K.G.: Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. Journal of accounting and economics 31(1-3), 405-440 (2001).
9. Huygh, T., De Haes, S., Joshi, A., Van Grembergen, W., Gui, D.: Exploring the influence of Belgian and South-African corporate governance codes on IT governance transparency. In: Proceedings of the 50th Hawaii International Conference on System Sciences: HICSS 2017, pp. 5184–5194. (2017).
10. Gordon, L.A., Loeb, M.P., Sohail, T.: Market value of voluntary disclosures concerning information security. MIS quarterly 34(3), 567-594 (2010).
11. Dehning, B., Richardson, V.J., Zmud, R.W.: The value relevance of announcements of transformational information technology investments. MIS quarterly 27(4), 637-656 (2003).
12. Oh, W., Ki m, J.W., Richardson, V.J.: The moderating effect of context on the market reaction to IT investments. Journal of Information Systems 20(1), 19–44 (2006).
13. Kim, J.W., Lim, J.H.: IT investments disclosure, information quality, and factors influencing managers' choices. Information & Management 48(2-3), 114-123 (2011).
14. Bharadwaj, A.S.: A resource-based perspective on information technology capability and firm performance: an empirical investigation. MIS quarterly 24(1), 169-196 (2000).
15. Anderson, M., Banker, R., Hu, N.: The impact of information technology spending on future performance. ICIS 2003 Proceedings, 47 (2003).
16. Chong, J.L., Duong, L.N.: Understanding IT governance effectiveness in Asia: An event study. Pacific Asia Journal of the Association for Information Systems 9(1), 3 (2017).

17. Panetta, I. C., Leo, S., Santoboni, F., Vento, G.: How do you disclose? Some evidence on it governance and performance in European banking system. Journal of Financial Management, Markets and Institutions 7(01), 1940002 (2019).
18. Pattnaik, D., Kumar, S., Vashishtha, A.: Research on trade credit–a systematic review and bibliometric analysis. Qualitative Research in Financial Markets 12(4), 367-390 (2020).
19. Lardo, A., Corsi, K., Varma, A., Mancini, D.: Exploring blockchain in the accounting domain: a bibliometric analysis. Accounting, Auditing & Accountability Journal 35(9), 204–233 (2022).
20. Caputo, A., Kargina, M., Pellegrini, M.M.: Conflict in virtual teams: a bibliometric analysis, systematic review, and research agenda. International Journal of Conflict Management 34(1), 1-31 (2023).
21. Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., Lim, W.M.: How to conduct a bibliometric analysis: An overview and guidelines. Journal of Business Research 133, 285-296 (2021).
22. Wang, Q., Ngai, E.W.T.: Event study methodology in business research: a bibliometric analysis. Ind. Manag. Data Syst. 120(10), 1863–1900 (2020).
23. Oshodi, O.S., Awuzie, B.O., Akotia, J., Ademiloye, A.S., Ngowi, A.: A bibliometric analysis of recycled concrete research (1978–2019). Built Environment Project and Asset Management 10(5), 725-736 (2020).
24. Della Corte, V., Del Gaudio, G., Sepe, F., Sciarelli, F.: Sustainable tourism in the open innovation realm: A bibliometric analysis. Sustainability 11(21), 6114 (2019).
25. Aria, M., Cuccurullo, C.: bibliometrix: An R-tool for comprehensive science mapping analysis. Journal of Informetrics 11(4), 959-975 (2017).
26. Sidhu, A.S., Singh, S., Kumar, R.: Bibliometric analysis of entropy weights method for multi-objective optimization in machining operations. Materials Today: Proceedings 50, 1248-1255 (2022).
27. Higgs, J.L., Pinsker, R.E., Smith, T.J., Young, G.R.: The relationship between board-level technology committees and reported security breaches. Journal of Information Systems 30(3), 79-98 (2016).
28. Vincent, N.E., Higgs, J.L., Pinsker, R.E.: IT governance and the maturity of IT risk management practices. Journal of Information Systems 31(1), 59-77 (2017).
29. Vincent, N.E., Higgs, J.L., Pinsker, R.E.: Board and management-level factors affecting the maturity of IT risk management practices. Journal of information systems 33(3), 117-135 (2019).
30. Sirisomboonsuk, P., Gu, V.C., Cao, R.Q., Burns, J.R.: Relationships between project governance and information technology governance and their impact on project performance. International journal of project management 36(2), 287-300 (2018).
31. Joshi, A., Bollen, L., Hassink, H., De Haes, S., Van Grembergen, W.: Explaining IT governance disclosure through the constructs of IT governance maturity and IT strategic role. Information & Management 55(3), 368-380 (2018).
32. Berkman, H., Jona, J., Lee, G., Soderstrom, N.: Cybersecurity awareness and market valuations. Journal of Accounting and Public Policy 37(6), 508-526 (2018).
33. Sofyani, H., Riyadh, H.A., Fahlevi, H.: Improving service quality, accountability and transparency of local government: The intervening role of information technology governance. Cogent Business & Management 7(1), 1735690 (2020).
34. Brown, W., Nasuti, F.: Sarbanes-Oxley and enterprise security: IT governance-what it takes to get the job done. Inf. Secur. J. A Glob. Perspect. 14(5), 15-28 (2005).
35. Kim, H.Y., Cho, J.S.: Data governance framework for big data implementation with a case of Korea. In: 2017 IEEE International Congress on Big Data (BigData Congress), pp. 384–391. IEEE, New York (2017).
36. Omotehinwa, T.O.: Examining the developments in scheduling algorithms research: A bibliometric approach. Heliyon 8(5), e09510 (2022).

37. De Haes, S., Huygh, T., Joshi, A., Caluwe, L.: National corporate governance codes and IT governance transparency in annual reports. Journal of Global Information Management (JGIM) 27(4), 91-118 (2019).
38. Hariani, S., Fakhrorazi, A.: determinants of financial reporting quality: an empirical study among local governments in Indonesia. International Journal of Economics and Finance Studies 13(2), 82-107 (2021).
39. Solana-González, P., Vanti, A.A., García Lorenzo, M.M., Bello Pérez, R.E.: Data mining to assess organizational transparency across technology processes: An approach from IT governance and knowledge management. Sustainability 13(18), 10130 (2021).
40. Nicho, M., Cusack, B.: A metrics generation model for measuring the control objectives of information systems audit. In: 2007 40th Annual Hawaii International Conference on System Sciences (HICSS'07), pp. 235c-235c. IEEE, New York (2007).
41. Hamdan, B.: Examining the antecedents of Sarbanes-Oxley Section 404 IT control weaknesses: An empirical study. In: 32nd International Conference on Information System 2011, pp. 2168–2181 (2011).
42. Haislip, J.Z., Karim, K.E., Lin, K.J., Pinsker, R.E.: The influences of CEO IT expertise and board-level technology committees on Form 8-K disclosure timeliness. Journal of information systems 34(2), 167-185 (2020).
43. Wiedenhöft, G., Luciano, E.M., Testa, M.G.: An indicators-Based Approach to Measuring Information Technology Governance Effectiveness: a Study with Brazilian Professionals. In ECIS. 2014 - Proceedings of the 22nd European Conference on Information Systems. (2014).
44. Al-Sartawi, A.: Information technology governance: The role of board of directors in cybersecurity oversight. In: ECCWS 2019 18th European Conference on Cyber Warfare and Security, p. 15. Academic Conferences and publishing limited, UK (2019).
45. Almaqtari, F.A., Farhan, N.H., Yahya, A.T., Al-Dalaien, B.O.A., Shamim, M.: The mediating effect of IT governance between corporate governance mechanisms, business continuity, and transparency & disclosure: An empirical study of Covid-19 Pandemic in Jordan. Information Security Journal: A Global Perspective 32(1), 39-57 (2023).
46. McLaughlin, M.D.J., Hansen, S., Cram, W.A., Gogan, J.L.: Snowfall and a stolen laptop. Journal of Information Technology Teaching Cases 5(2), 102-112 (2015).
47. Irhandayaningsih, A.: Performance measurement of information technology governance in The Library of Diponegoro University using COBIT assessment framework. In: E3S Web of Conferences, p. 15001. EDP Sciences, France (2020).
48. Gandhi, A., Ruldeviyani, Y., Sucahyo, Y.G.: Strategic information systems planning for bureaucratic reform. In 2017 International Conference on Research and Innovation in Information Systems (ICRIIS), pp. 1–6. IEEE, New York (2017).
49. Cherinka, R., Miller, R., Prezzama, J., Smith, C.: Reshaping the enterprise with web 2.0 capabilities: Challenges with main-stream adoption across the Department of Defense. Computing, Communications and Control Technologies (CCCT) 2, 90–95 (2010).

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