



## Audit Quality: A Bibliometric Analysis (1981-2020)

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### Abstract

The increase in the number of studies on audit quality and the interest of both researchers and authorities in the subject in recent years has been the motivation of the study. Bibliometry was chosen as a method in the study because it provides the opportunity to look at the literature of the area studied from a broad perspective. The study aims to make a bibliometric analysis of studies published in English in the field of social sciences in the Scopus database on audit quality (AQ). This analysis covers 1419 articles from 1981 to March 2020. It has been determined that academic research on AQ has increased dramatically since the 2000s. 'Audit quality', 'audit fees', 'earning management' issues are up-to-date in the studies carried out; Researches on 'Public Company Accounting Oversight Board' (PCAOB), 'financial reporting' and 'audit committee' turned out to be on the rise. The country that gets the most citation on the subject is USA. It was also concluded that numerous non-authors frequently collaborated amongst them to contribute to the development of the field. In addition, although there are publications using a qualitative research method with the increasing number of publications with AQ, it is the first bibliometric and social network analysis in the study area. While this study helps to create the conceptual framework that still causes controversy in the field of AQ; It can be a guiding resource in determining future studies and regulations.

**Keywords:** audit quality; auditing; bibliometric analysis; auditor; PCAOB.

**JEL classification:** C00; M42.

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### 1. INTRODUCTION

Faced with rapid developments in information and communication technologies, companies' ability to compete more easily, their sustainability, and the increase in the expectations of stakeholders have increased the importance of the concept of quality. High audit quality increases the reliability and quality of the financial reports. However, audit quality (AQ) is not the only component of financial reporting quality (DeFond and Zhang, 2014).

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While high audit quality increases the quality of the financial reports and supports well-informed investment decision and financial stability (IAASB, 2020a, 2020b), it also acts as a monitoring mechanism that decreases information asymmetry between managers and shareholders (Arens *et al.*, 2012). The quality audit helps businesses to receive credit from the most prestigious creditors and attract potential partners for con investments. The quality and reliability in the audit include audit activities to be completed in line with pre-determined criteria and regulations and applying quality control procedures. Independent and unbiased auditor plays an important role to increase the public trust towards capital markets by providing better information and trust for the financial statement reliability and accountability reported by the management. Thus, audits help to increase economic well-being (ICAEW, 2005).

It is observed that studies and regulations related to audit qualities have drastically increased since the 2000s. This is because of the Enron scandal in 2001 which involved the most important company around the world and following Worldcom, Global Crossing, Adelphia Communications, Tyco, AOL Time Warner, Rite Aid, Xerox, Imclone, Worldcom and Qwest scandals in global accounting and audit fields (Cunningham, 2002). These scandals have led to a decrease in trust in financial reports, company management, companies that carry out independent auditing, and capital markets, and question the quality of work in the audit profession (Teck-Heang and Azham, 2008; Kilgore *et al.*, 2011).

A series of international regulation is made to recreate the trust towards capital markets and to protect the public good. The first and ground-breaking regulation was the Sarbanes-Oxley (SOX) Act which has been a reference to other regulations. Sarbanes-Oxley Act created the Public Company Accounting Oversight Board (PCAOB) to audit the public company auditors and set the audit standards. The purpose of this PCAOB board is to encourage informed, accurate and independent audit reports to audit the audits of public companies to protect the investors and public good (PCAOB, 2020). PCAOB efforts in the USA and 'Audit Quality Framework' published by International Audit and Assurance Standard Board (IAASB) as the indicator of International Audit Standards are the most important and pioneering works in this field. IAASB (2014), published an international standard to contribute to conducting quality audits.

In the same period, European countries experienced similar accounting scandals such as Italy's Parmalat and Holland's Ahold partnership (Teck-Heang and Azham, 2008). European Union has introduced changes in 2006 with a directive (2006/43/EC) for public oversight, quality assurance in audit, the privacy of customer information, audit committees, transparency in audit firms, disclosure of audit fees, independence and unbiased of auditors, compliance with international audit standards and liabilities of group auditors.

On the other hand, with the 2008 global financial crises, policymakers attempted to identify the driving forces in audit quality. Some of the examples can be given as establishing "Advisory Committee on the Auditing Profession" (2008) in the USA, publishing "Promoting Audit Quality" (FRC, 2006) in the United Kingdom, publishing Audit Quality - Strategic Review (2010) in Australia and publishing Green Book Audit Policy: Lessons Learned from Crises (2010) in Europe (Kilgore *et al.*, 2014). Related to audit quality, Centre of Audit Quality (CAQ) working under American Institute of Chartered Public Accountants (AICPA) works to increase investor trust in global capital markets as well as the public trust (CAQ, 2020).

As a result, the last two decades have experienced a boom in radical changes in audit occupation and audit research. The dominant property of recent studies is that these studies focus on audit quality. However, measurement of audit quality is challenging as the amount of auditor assurance cannot be observed (DeFond and Zhang, 2014; FEE, 2016). While there is not a common approach to measure the audit quality, the literature is reviewed from different perspectives. These perspectives include the size of the audit firm, auditor reputation, industry expertise, auditor tenure, out-of-control fees, audit committees, the duration of auditor-customer relationship (Francis, 2004).

In short, the main driving forces of the audit quality are still questioned and efforts to improve financial reporting reliability, validity, and audit quality of the global regulators are ongoing (Montenegro and Brás, 2018). Therefore, audit quality topic continues to be a current topic for scientific research, public and regulatory institutions and the number of studies in this field is increasing. One of the methods to evaluate the output of the scientific studies in the bibliometric analysis.

Bibliometrics are defined as a new discipline as it uses mathematical and statistical methods to investigate the scientific communication process by adapting to written documents (Pritchard, 1969). Simply, it is one of the tools to statistically measure the outputs of the scientific publications (Godin, 2006). The purpose of the bibliometric analysis is to obtain valuable information by collecting information on a database on a certain topic (publications, citations, authors, journals, institutions, keywords etc.) to expand the related topic or discipline that helps to understand the importance of the topic. Thus, it is possible to offer a macroscopic general perspective to the academic literature and assess research trends (Lee *et al.*, 2020). At the same time, a bibliometric study generates a driving force for researchers to be proactive and current to the developments in the related field (Samiee and Chabowski, 2012).

It is observed that the number of studies using bibliometric analysis as a research method and research assessment are increasing in recent years (Waltman and Noyons, 2018). This shows that bibliometric analysis is regarded as an important and valuable method to assess scientific production (Ellegaard and Wallin, 2015). Bibliometric studies become easier with the strong development of computers and the spread of internet access (Merigo *et al.*, 2015). The usage of the web-based bibliographic database increases this trend as well. Web of Science, Scopus, and Google Scholar is the most frequently used bibliometric databases. (Waltman and Noyons, 2018). At least 3 years to measure the publication effect in a reliable manner has become a standard application in the bibliometric study (Bornmann and Leydesdorff, 2014).

Bibliometric analysis can be applied to any subject and all disciplines. A general bibliometric perspective has been offered to various studies and research fields in the literature. In this field, José M. Merigó Lindahl is a salient scientist with high impact value working on different disciplines. Some of the study areas of the author are accounting (Merigo and Yang, 2017), fuzzy research (Merigo *et al.*, 2015; Blanco-Mesa *et al.*, 2017), economy (Bonilla *et al.*, 2015), marketing (Martinez-Lopez *et al.*, 2018; Valenzuela *et al.*, 2017), finance (Cancino *et al.*, 2018), health (Merigo and Nunez, 2016).

Most of bibliometric studies in the audit field are about 'audit' (Uyar *et al.*, 2020; Öztürk and Yilmaz, 2018; Melo Ribeiro, 2015), 'Continuous Audit' (Folador *et al.*, 2018), 'Internal Audit' (Behrend and Eulerich, 2019a), 'Audit Committee' (Behrend and Eulerich, 2019b), 'Audit Rotation' (Marassi *et al.*, 2014). Some of qualitative studies are also about

‘Audit Research’ (DeFond and Zhang, 2014), ‘Audit Quality’ (Montenegro and Brás, 2018; Knechel *et al.*, 2012; Aghaei Chadegani, 2011) and ‘Audit Quality and Auditor Independence’ (Tepalagul and Lin, 2015). As can be seen, while there are bibliometric studies related to audit, qualitative analysis method is considered in the studies in audit quality field.

Data is collected from the Scopus database, which is generally accepted as one of the most effective databases in scientific research. An analysis was conducted on 10/03/2020 and 1419 studies published between 1981-2020 were found. Among these studies, 1360 were articles, 28 were proceedings, 25 were book chapters and 5 were books. This study tries to answer the following research questions.

1. Research question 1: Which topics do AQ studies cover and which topics tend to stand out in this field?
2. Research question 2: What are the most cited articles in AQ field?
3. Research question 3: Which authors have the highest impact factors in AQ field?
4. Research question 4: What is the collaboration between the authors in AQ field?
5. Research question 5: What is the collaboration between the countries in AQ field?

The study aims to guide the researchers in AQ field and to provide a general panoramic picture. The path of AQ studies is important in terms of the development in time and the changes. Additionally, this study will be one of the first studies in this field. This study will contribute by completing the results of the qualitative studies.

The remaining sections of this study are organised as follows. “Literature review” section presents the literature review on important publications, qualitative and quantitative analysis studies. The methods section briefly evaluates the bibliometric methods. The conclusion section summarises the key findings and results of this study.

## 2. LITERATURE REVIEW

There is an extensive literature on audit quality and measurement, and there are different definitions around the world. However, none of these definitions is globally accepted. This is because the audit quality is a complex and multi-dimensional topic. Therefore, audit quality assessment is challenging (FRC, 2006; IAASB, 2011; Knechel *et al.*, 2012; PCAOB, 2013; CAQ, 2016; FEE, 2016). The commonly cited audit quality definition in scientific studies is provided by DeAngelo (1981).

DeAngelo (1981) defined audit quality as auditors (a) identifying a breach by the customer firm in the accounting system and (b) the possibility of the market valuation of including this breach in the report. According to DeAngelo, the possibility for the auditor to report incorrect statement is related to auditor independence.

Palmrose (1988) defines audit quality as the assurance level provided by the auditor for financial tables not having incomplete or incorrect information. The higher assurance level offers more quality audit service. The most important point of this definition is the lower possibility of audit failure (incomplete or incorrect financial table) in more quality audits.

Becker *et al.* (1998) defined audit quality as auditor detecting suspicious and incorrect accounting application and expressing this situation in the audit reports. Therefore, it is possible to argue that high audit quality has a deterrent effect on incorrect financial reporting.

Francis (2004) expressed this practice as applying generally accepted accounting principles and publishing a qualified audit report by the auditor and defined the concept as

the ability of the auditor to complete legal and occupational requirements. When these are not present, audit quality will be low, the audit will fail, and financial statements will be misleading for the shareholders.

Carcello and Nagy (2004) defines audit quality in terms of assurance level by the audit and classified the concept with audit efforts by expressing that audit quality is directly connected to the amount of audit work.

DeFond and Zhang (2014) defined higher audit quality as “the higher assurance reflected by the firm about its basic economy based on financial statements, financial reporting system of the firm, and intrinsic properties.” The audit quality perception varies based on the perspectives of all shareholders in the financial reporting process. Different shareholder views lead to recommending different proxies in the audit quality (Knechel *et al.*, 2012).

In short, while there is no united definition for audit quality, there is also no standardises proxies directly measuring the audit quality. This is caused by the challenges intrinsic in the audit quality measurement and lack of auditor assurance (DeFond and Zhang, 2014). Lack of direct measurement possibilities for the audit quality has led this topic to be analysed from different perspectives in the literature (audit fees and hours, reputation, industry expertise, lawsuit risk, auditor independence, ethics, auditor size and abnormal assessments).

Some of the most determinative pioneering studies with the highest number of citations on proxies determining the audit quality are as follows:

DeAngelo (1981) stated that the audit firm size is the most important determinant of the audit quality. Balsam *et al.* (2003) investigated the relationship between earnings quality and auditor industry expertise and found that industry expert auditors had a lower arbitrary assessment and higher-earning coefficient from auditor customers compared to low industry expertise. Johnson *et al.* (2002) found that firms with shorter auditor tenure had larger and less permanent assessments than medium or long auditor tenure. Reichelt and Wang (2010) stated that audit quality is systematically related to common national and city-specific industry expertise. Francis and Yu (2009) tested a positive relationship between large auditor firms and audit quality. Ghosh and Moon (2005) emphasised that mandatory limitations on auditor-customer relationship duration might incur undesired costs on capital market participants. It is argued that financial statements and especially the reported earnings of the firms with longer auditor tenure are perceived as more reliable. Carcello and Nagy (2004) found that the negative impact on mandatory audit firm rotation has negative impacts on audit quality and determined that auditors with three years or lower tenure have higher chance to report fraudulent financial statements. Becker *et al.* (1998) used the auditor brand name investigated the relationship between auditor brand name and earning quality. Palmrose (1988) proved that there is a positive relationship between audit fee and audit quality. This was explained by both auditor efforts (more invoiced work hours) and higher expertise use (higher hourly invoicing).

The high versatility in the views is caused by the lack of direct observation for audit quality. This has led the regulatory institutions, audit firms, and scientists to measure audit quality by using new metrics/proxies. Therefore, it is critical to investigate the context and suitability of certain indicators to deeply understand quality.

It is observed that the studies related to audit quality increased rapidly in the last two decades. This has led the topic to be analysed qualitatively and quantitatively interesting. The analysis contributes to provide a holistic picture and identify the trends. The qualitative

studies on audit quality are highly comprehensive and the results of these studies are given below.

Francis (2011) conducted a literature review on the factors related to audit quality and presented a general framework. The study presented a framework audit quality that is affected by auditor competence and independence, auditor's firm, auditing institutions, incorrect behaviours of the auditor and accounting company and punitive institutions for low-quality audits. The authors suggested cooperation-based research between practitioners and regulators to achieve better audit quality. Furthermore, the author stated that such cooperation can contribute to better understand the audit quality.

Knechel *et al.* (2012) present a review of scientific studies in AQ field. The study summarises audit quality indicators such as audit fundamental characteristics and inputs, processes, and results. The studies showed that audit tenure, out-of-audit services, in-company pressures and incentives related to audit partner fees can have a positive or negative effect on auditor decisions. The studies on audit results found that ambiguity can potentially emerge in negative ways (assessment levels, corrections, audit report quality, etc.). The study identified that numerous studies provided views on compensating factors and techniques to decrease auditor errors. The study emphasised that audit quality is connected with auditor team decision and expressed that audit quality is a perceived property rather than an observed property. The authors stated that "a balanced scorecard" representing the audit fundamental properties is required to facilitate shareholder perception about audit quality. Lastly, the authors recommended that audit firms, customers, regulators and academic institutions should conduct new studies on audit quality drivers.

DeFond and Zhang (2014) focused on published from 1996 to mid-2013. The researchers found that various proxies are used for audit quality and only a few could act as a guide. The authors emphasised that audit quality is at the same time connected to the firm's intrinsic properties and financial reporting systems. The authors expressed that the literature still mainly focused on the supply-side factors and recommended that more studies are necessary for auditor role/competence and customer competence to increase audit quality. The authors further recommend that the effect of auditor competence and occupational scepticism on audit quality should be closely investigated by using larger audit firms, auditor offices and individual auditor characteristics. Lastly, the authors recommended using the new regulatory environment and intervention to measure audit quality.

Tepalagul and Lin (2015) presented a comprehensive literature review on auditor independence and audit quality. The study was conducted by investigating articles in nine journals between 1976-2013 period. The majority of the studies found that long auditor tenure did not disrupt the audit independence. Some studies showed that long tenure actually improved audit quality and short tenure is related to low audit quality. This study recommends more research in this field. The results of the review showed that non-audit services (NAS) damage audit quality. Additionally, there were empirical studies that showed tax-related NAS significantly increased audit quality. On the other hand, public disclosure of NAS fees decreased NAS purchases. These findings provided evidence that financial statement users see NAS as a threat against auditor independence and audit quality. Additionally, researches suggested that intercountry comparisons could be used due to legal and cultural difference in auditor independence and audit quality researches. The authors expressed that analysing various countries can contribute to reveal the differences between



incentives, perceptions and behaviours of multiple actors (auditor, customer and financial statement users).

Montenegro and Brás (2018) reviewed a thirty-year long (1980-2010) audit quality literature with a critical perspective. The authors compared international studies with studies in the US. The authors found that majority of the studies with input-based criteria in audit quality focused on auditor-customer agreement properties (especially to audit fees) and auditor brand name and auditor industry experience is used as an audit quality proxy since the 2000s. The majority of the studies that used audit quality as an output revealed that audit reporting and financial reporting quality proxies are centralised. The authors suggested that international studies that used auditor lawsuit activities as an audit quality representation are lacking. Additionally, the authors revealed that studies on PCAOB audit increased. While the authors suggested that studies that evaluated audit quality from a shareholder perspective (qualitative perspective) are missing, they stated that auditor technical competence, experience and independence in the USA and international studies are perceived important by the users. Lastly, the authors suggested that gathering multiple proxies could be the best solution to achieve audit quality as audit quality cannot be observed.

The common point of the qualitative studies was recommending new proxies to better measure the audit quality. This clearly shows that related studies should consider different dimensions to conceptualise audit quality.

There are no bibliometric studies in the literature in audit quality field. Additionally, there are few studies on different fields of the audit. The summary of bibliometric studies in audit field is given as follows.

Uyar *et al.* (2020) investigated the conceptual structure of audit discipline on 2,119 articles published in 24 accounting and audit journals between 2000 and 2016 by using keyword, co-citation analysis, and social network analysis (SNA). Öztürk and Yilmaz (2018) articles analysed a total of 2599. The author's analyses publications in audit and legal accounting between 1960 and February 2018 on SSCI (Social Sciences Citation Index). Melo Ribeiro (2015) used bibliometric and social network analysis methods to analyse 107 scientific studies on a journal published in Brazil for 1999-2013 period. Folador *et al.* (2018) analysed a total of 96 articles between 2004-2014 on international Scopus and Contesci databased on continuous audit and system audit fields. Behrend and Eulerich (2019b, 2019a) analysed a total of 170 publications between 1926 and 2016 on leading accounting journals on internal audit topic. Marassi *et al.* (2014) investigated international scientific in audit rotation between 1996-2012 by using bibliometric and sociometric analysis. The authors analysed 69 articles on Science Direct and Scopus databases.

As can be seen from these studies, it is possible to state that the number of bibliometric studies in audit field increased in recent years. In line with these developments, this study conducted an analysis due to the lack of bibliometric studies in audit quality field and to complement the qualitative analysis.

### 3. METHODOLOGY

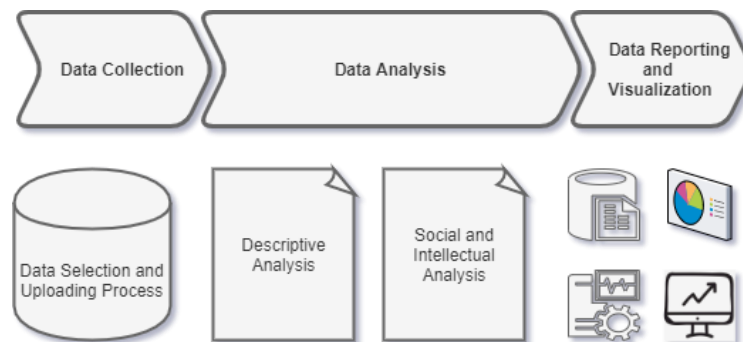
This study uses a systematic literature review among bibliometric techniques. Bibliometrics enables us to look into the related literature about the investigated topic from a large perspective. The analysis in this study was conducted on the open-source R program and its package called "bibliometrix" (Aria and Cuccurullo, 2017). The articles, proceedings,

books, and book chapters published in the English language in the social science field on the Scopus database with “audit quality” in the title, abstract, and keywords were included in this study. The following parameters were adopted for the Scopus database search.

*TITLE-ABS-KEY ("audit quality") AND (EXCLUDE (SUBJAREA, "MEDI") OR EXCLUDE (SUBJAREA, "ENGI") OR EXCLUDE (SUBJAREA, "COMP") OR EXCLUDE (SUBJAREA, "ENVI") OR EXCLUDE (SUBJAREA, "ENER") OR EXCLUDE (SUBJAREA, "AGRI") OR EXCLUDE (SUBJAREA, "MATH") OR EXCLUDE (SUBJAREA, "BIOC") OR EXCLUDE (SUBJAREA, "NURS") OR EXCLUDE (SUBJAREA, "EART") OR EXCLUDE (SUBJAREA, "MATE") OR EXCLUDE (SUBJAREA, "PSYC") OR EXCLUDE (SUBJAREA, "CENG") OR EXCLUDE (SUBJAREA, "CHEM") OR EXCLUDE (SUBJAREA, "DENT") OR EXCLUDE (SUBJAREA, "HEAL") OR EXCLUDE (SUBJAREA, "PHAR") OR EXCLUDE (SUBJAREA, "IMMU") OR EXCLUDE (SUBJAREA, "VETE")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "ch") OR LIMIT-TO (DOCTYPE, "bk"))*

An analysis was conducted on 10/03/2020 and 1419 studies published between 1981-2020 were found. Among these studies, 1360 were articles, 28 were proceedings, 25 were book chapters and 5 were books.

The obtained data were first transferred to the R program and descriptive information was obtained with the help of the bibliometrix package. Then, impact factors of journals and authors were examined. In addition, the concepts and themes in the articles were examined. Finally, collaborations in the literature were examined. The bibliometric workflow process is shown in [Figure no. 1](#).



Source: adapted from [Aria and Cuccurullo \(2017, p. 963\)](#)

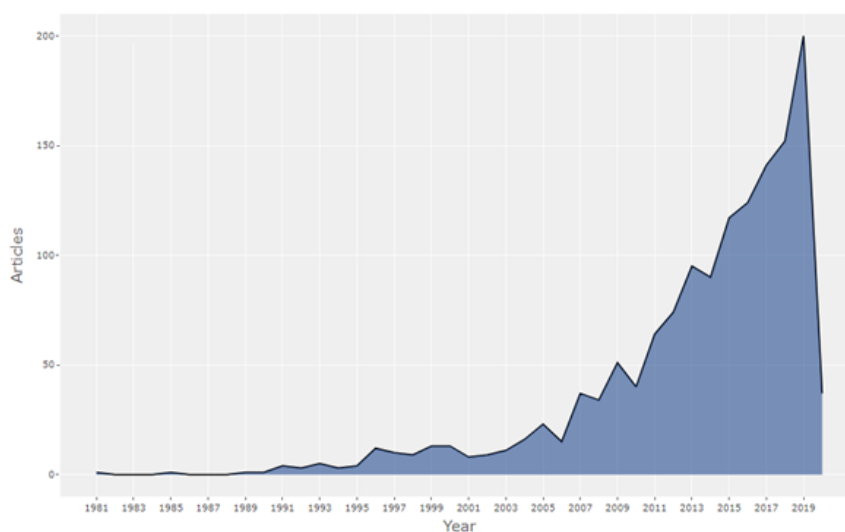
**Figure no. 1 – Bibliometric Workflow**



## 4. FINDINGS

### 4.1 General Descriptive Findings

As shown in [Figure no. 2](#), which studies in “audit quality” (AQ) has 39-years of history (1981-2020) and the number of studies increased especially after the 2000s. It was seen that studies showed 11.56 % Compound Annual Growth Rate (CAGR) and an average of 36.36 publications were published every year. With the rapid growth in recent years, the number of publications in 2019 reached 200 and 37 publications were published in the first 2 months of 2020.



**Figure no. 2 – Annual Scientific Production**

When [Table no. 1](#) is analysed, 2379 authors were encountered 3587 times in AQ field in 39-years period (1981-February 2020). Additionally, it was seen that authors published 1418 publications in 274 different sources (journals, conferences, books etc.). There was a relatively high citation number as 20.35 citations per publication. The majority of the publications (83.36%) were published by multiple authors. Although all studies in the literature had 1.68 authors per publication, the average number of authors in these studies was 2.53. This confusion is related to how the contribution of single authors and multiple authors' studies are assessed. In bibliometric studies, certain index values are calculated to prevent the confusion caused by these two phenomena. The most common index is Collaboration Index (CI). It was found that CI value was 1.84 in AQ field. CI value considers the average author's number in multiple authored publications. In this field, publication number per author was 0.60. The average number of keywords per publication was calculated as 1.67. While this number seems relatively low, it is known that keyword was not a standard practice in journals until recently ([Aria et al., 2020](#)). Additionally, it is natural not to have keywords in books and book chapters in AQ field. However, it was found that the majority (96%) of the publications were articles.

**Table no. 1 – General Descriptive Findings of AQ Publications**

<b>Description</b>	<b>Results</b>
Documents	1418
Sources	274
Author's Keywords	2374
Years	1981 - 2020
Average citations per documents	20,35
Authors	2379
Author Appearances	3587
Authors of single-authored documents	200
Authors of multi-authored documents	2179
Single-authored documents	236
Documents per Author	0,60
Authors per Document	1,68
Co-Authors per Documents	2,53
Collaboration Index	1,84

#### 4.2 Findings for Documents

The numerical data for the keywords to discover which topics were analysed or which topics were analysed together in AQ studies is given in [Table no. 2](#). According to the obtained data, the frequency of keywords obtained by the authors in all publications was identified. The top 10 keywords commonly preferred in the articles and proceedings are listed in [Table no. 2](#).

**Table no. 2 – Keyword Frequency**

<b>Words</b>	<b>Occurrences</b>
audit quality	661
corporate governance	120
audit fees	112
earnings management	92
auditing	88
discretionary accruals	54
auditor independence	50
auditors	39
audit committee	38
pcaob	35

The frequency of keywords provides important data about the trends. Additionally, trend topics were investigated to see how AQ research developed and how the trends have changed over the years. The annual logarithmic frequency of the keywords is shown on a coordinate plane ([Figure no. 3](#)).

The analysis is based on the annual distribution of the first three keywords selected for more than five times. When the keywords that fit this rule were analysed, it was possible to observe the trend topics that started to represent a common language in AQ research after 2005. Within this scope, it was seen that research topics such as audit quality, audit fees, earning management were still important but research topics such as corporate governance, auditing became less important. Additionally, it was seen that research topics such as audit committee, PCAOB, and financial reporting quality were popular in recent years.

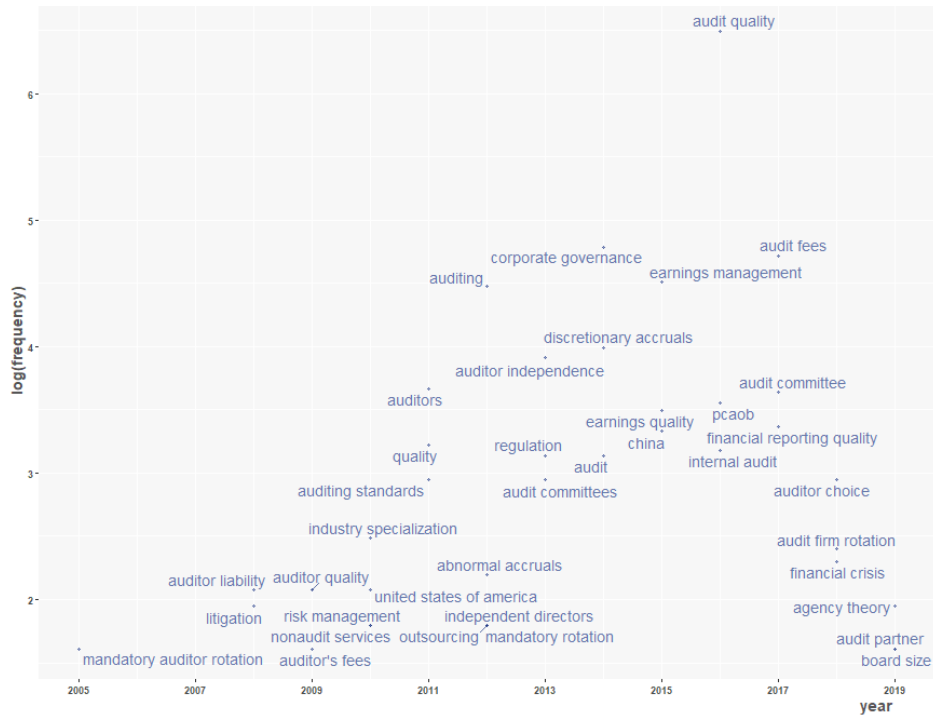


Figure no. 3 – Topic Trends of AQ Field



Figure no. 4 – Co-Word Analysis of AQ Field

Co-word or co-analysis shows which keywords are used together. The size of the keywords on the network emphasises the keyword frequency and the same colour and proximity emphasise the high collaboration relationship. Each keyword on the network forms the node and the connection between the nodes form the edge. Co-word analysis created with the keywords in AQ field (n=30) used “association” as the normalising method and “Louvain” as the clustering method (Figure no. 4). There are studies suggesting that Louvain algorithm generates faster results than similar alternatives (Blondel *et al.*, 2008). When a network for AQ research keywords was created, nodes with multiple connections were included and ineffective nodes were eliminated. Additionally, the network map was limited with the 30 most effective nodes. When the clusters were analysed, it was seen that the impact element in the blue cluster was “audit quality”, “corporate governance” element was dominant in the red cluster and lastly, “auditing” term was seen in the green cluster.

The studies with the highest number of citations in AQ researches are given in Table no. 3. The Table lists the publication year, the number of citations within investigated AQ studies, and citation numbers from all disciplines (based on Scopus databases). Additionally, GC/LC ratio was calculated. The higher ratio shows that the study receives citations outside AQ study network. Especially the GC/LC ratio of DeAngelo (1981) and Becker *et al.* (1998) positively differentiates from other studies. The reputation of Francis Francis (2011) and DeFond and Zhang (2014) are relatively lower than other studies at the global level. The studies with the highest GC/LC ratio in AQ field in Table no. 3 show similarities in terms of the GC/LC ratio. DeAngelo (1981) and Becker *et al.* (1998)’s studies in AQ field with a high GC/LC ratio received citations. The pioneering study of DeAngelo (1981) was cited in at least 1 in every 3 (34.80%) studies in AQ field while Becker *et al.* (1998) were cited in 1 in every 4 studies (23.62%) in AQ field.

**Table no. 1 – Local and Global Citations**

Document	Year	Local Citation (LC)	Global Citation (GC)	GC/LC
DeAngelo (1981)	1981	493	1727	3,50
Becker <i>et al.</i> (1998)	1998	335	1244	3,71
DeFond and Zhang (2014)	2014	180	420	2,33
Balsam <i>et al.</i> (2003)	2003	156	427	2,74
Johnson <i>et al.</i> (2002)	2002	130	374	2,88
Reichelt and Wang (2010)	2010	121	299	2,47
Francis and Yu (2009)	2009	112	331	2,96
Ghosh and Moon (2005)	2005	104	276	2,65
Francis (2011)	2011	99	223	2,25
Carcello and Nagy (2004)	2004	92	264	2,90

#### 4.3 Findings for Authors

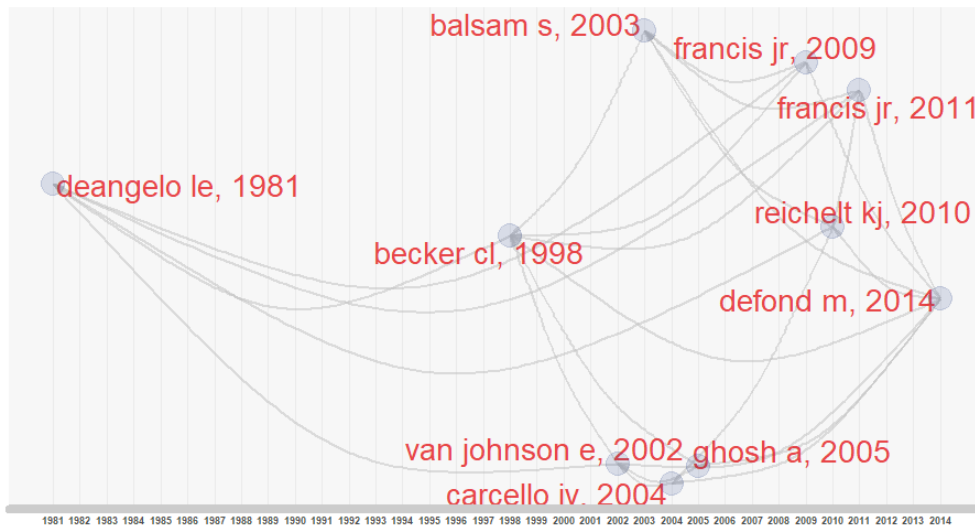
The impact factor (IF) values of the authors in AQ field are shown in Table no. 4. Although the h-index is more common in the literature, it is possible to state that other index values with h-index have a high contribution (Bornmann and Leydesdorff, 2014). In Table no. 4, the author ranks and publication numbers in AQ field were determined. Accordingly, it was seen that the highest number of publications was by Gul A.F.(n=16) followed by Knechel W.R. (n=12) and Raman K.K (n=10). It was seen that the first contribution to the highest publication list was by Francis J.R. in 1989. Additionally, Francis J.R. had 166

(1494/9) citations per publication in AQ field. However, it was seen that DeAngelo L.E. as the author of the pioneering article entered to AQ field in 1981 and received 1727 citations with one article. Since index values are developed on productivity, it can be seen that the high number of publications and receiving a citation to these publications impact the ranking. According to the information given in Table no. 4, the highest score in all index values was Gul. F.A.

**Table no. 2 – Impact Factors of Top 10 Authors**

Author	h-index	g-index	m-index	TC	NP	PY_start
Gul F.A.	11	16	0,73	826	16	2006
Knechel W.R.	7	12	0,50	335	12	2007
Raman K.K.	5	10	0,38	213	10	2008
Krishnan J.	9	9	0,38	823	9	1997
Carcello J.V.	7	8	0,29	895	8	1997
Chi W.	5	8	0,41	223	8	2009
Choi J.H.	6	9	0,46	633	9	2008
Francis J.R.	8	9	0,25	1494	9	1989
Kim J.B.	8	8	0,50	844	8	2005
Krishnan G.V.	5	8	0,28	428	8	2003

Note: TC: Total Citation, NP: Number of Publications, PY: Publication Year



**Figure no. 5 – Historical Direct Citation**

Although the article impact factor values provide a general idea about the authors with an important effect in AQ field, these values are not sufficient alone. Accordingly, the impact level on other authors in a historical period was analysed with Historical Direct Citation (Figure no. 5). It can be clearly seen that DeAngelo (1981)’s article is one of the pioneering articles in this field from “historical direct citation” analysis. Fundamentally, this analysis was developed to show how much the referenced sources are similar in the studies. Figure no. 4 shows the impact of DeAngelo and used sources in AQ field. It can be seen that

Becker *et al.* (1998) was influenced by DeAngelo and impacted the field in a similar way. Balsam *et al.* (2003) especially impacted the publications close to today's date. It was seen that Francis who has the highest citation per publication used similar sources to Becker as a reference in multiple publications (Francis and Yu, 2009; Francis, 2011).

#### 4.4 Findings for Collaborations

The collaboration networks present the collaboration between the authors with the social network. Fundamentally, this analysis is based on the authors and investigates the institutions of these authors and collaboration between the institution's countries. Before the network analysis, author x author, country x country, are analysed for collaboration frequency and adjacency matrix is created.

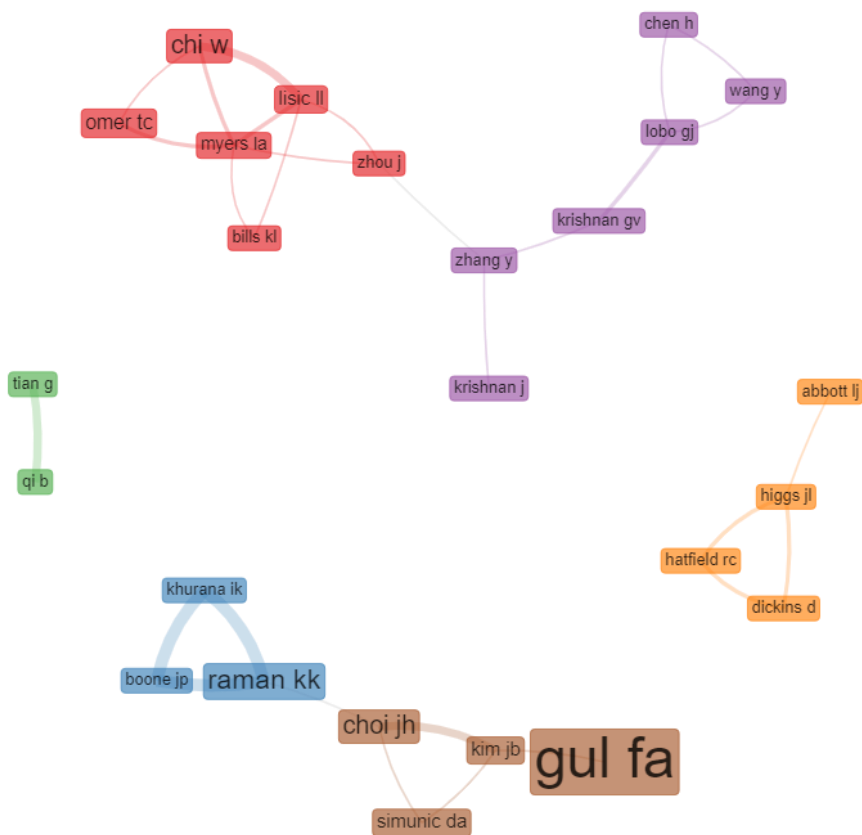


Figure no. 6 – Collaboration Networks for Authors

In the network analysis in Figure no. 6, nodes with multiple connections were included and ineffective nodes were eliminated. Thus, a network map with 25 authors and 6 clusters was visualised. “Association” was used as a normalisation method and “Louvain” was used



in clustering. The authors in the same cluster show more frequent collaboration and thickness of the connections (edges) show higher collaboration. Additionally, as the nodes grow (author names), the impact of the authors on the network grows as well. The author-publication number and impact factor in [Table no. 4](#) and collaboration analysis showed similar results. For example, Gul. F.A. was the most publishing author and the most impactful elements of the brown cluster. A similar situation was valid for Raman K.K. as the most impactful node in the blue cluster and Chi W. as the most impactful node of the red cluster. Additionally, the highest collaboration in AQ field with the highest number of publications was represented by Krishnan J. and Krishnan G.V. in the purple cluster.

The citations of the authors in AQ field for countries are given in [Table no. 5](#). The highest cited country was clearly the USA and followed by Hong Kong (41.48) in citation per publication. It was found that Holland, Canada, and the UK are leading in terms of citation per publication. Although Australia ranks third (15.25), the country is below sixth South Korea (12.40), eight Belgium (20.31), and ninth Spain (15.75) in terms of average citation (20.35) in citation per publication. Other than the native English-speaking countries, the average citation numbers of other countries with a low MCP ratio was low. However, although Australia is a native English-speaking country, the average citation number per publication was low.

**Table no. 3 – Number of Citations per Publication for Countries**

Country	TC	AC	NP	SCP	MCP	MCP Ratio
USA	10102	36,74	275	234	41	0,15
Hong Kong	1286	41,48	31	13	18	0,58
Australia	930	15,25	61	42	19	0,31
United Kingdom	876	30,21	29	22	7	0,24
Canada	607	30,35	20	14	6	0,30
Korea	471	12,40	38	23	15	0,39
Netherlands	315	31,50	10	3	7	0,70
Belgium	264	20,31	13	11	2	0,15
Spain	252	15,75	16	13	3	0,19
France	249	24,90	10	6	4	0,40

Note: TC: Total Citation, AC: Average Citation, NP: Number of Publication, SCP: Single Country Publications, MCP: Multiple Country Publications

The authors represent their affiliated institutions and the countries of these institutions when publishing. The collaboration networks can be visualised based on the publication country. Accordingly, the collaboration network for countries in AQ field was visualised in [Figure no. 7](#) and the “association” method was used for normalisation and “Louvain” algorithm was preferred for clustering. The map with nodes with at least connection had 27 elements. Within this scope, it can be seen that the USA was dominant in the red cluster, Australia was dominant in the blue cluster, Holland was dominant in the purple cluster and the UK was dominant in the green cluster. It is believed that high publication, average MCP value but low average citation number of Australia was caused by a lower collaboration level than the more impactful clusters.

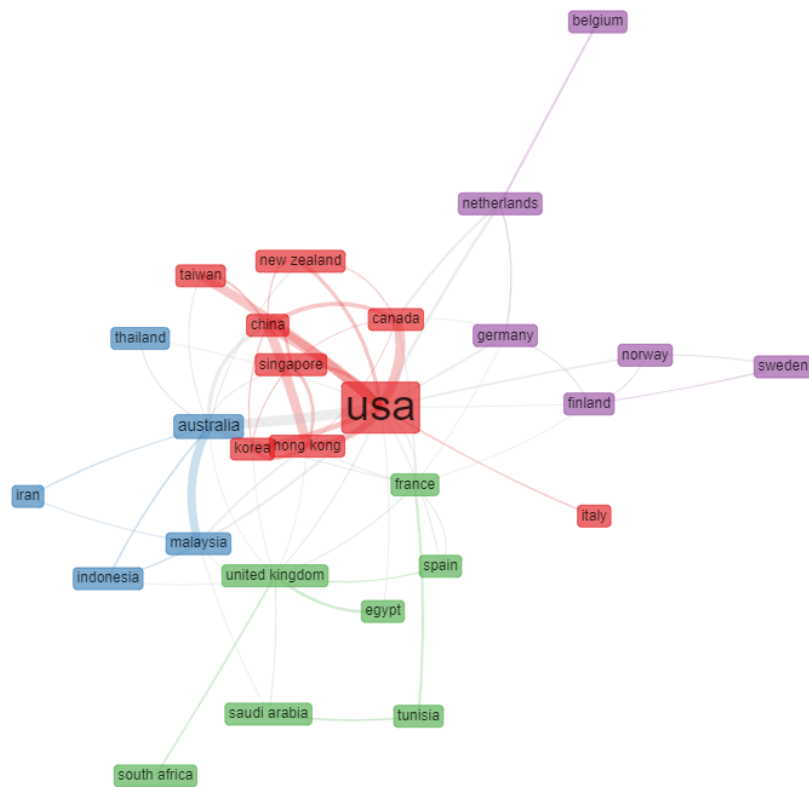


Figure no. 7 – Collaboration Networks for Countries

## 5. DISCUSSION AND CONCLUSION

This study analysed 1419 studies published between 1981-2020 in the social science field in the English language on the Scopus database. Among these studies, 1360 were articles, 28 were proceedings, 25 were book chapters and 5 were books. This study adopted a systematic literature review among bibliometric techniques. This study analysed the studies with “audit quality” in the title, abstract, or keywords.

The number of studies increased since the 2000s. This is because of the global accounting scandals and financial crises in this period. With the rapid growth in recent years, the number of publications in 2019 reached 200, and 37 publications were published in the first 2 months of 2020. As can be seen, audit quality continues to be an attractive topic in the scientific arena. The abstract form of audit quality and challenges in measuring continues to make this field attractive. Moreover, the radical changes in the audit occupation and continuous changes preserve the importance and questioning of this topic.

The name of the 2379 authors in AQ field can be seen 3587 times. These authors published 1418 publications. The relatively high citation number as 20.35 citations per publication gives a broad idea about the quality of the studies. Additionally, the majority of the publications were published by multiple authors. Although the number of authors per

publication was not high, the number of names in these publications was striking. The main reason for that was the tendency to have the same authors in multiple publications. It can be stated that the authors frequently collaborated in the publications to contribute to the development of the field. It is suggested that publications with more authors tend to receive more citations compared to publications with fewer authors (Gazni *et al.*, 2012).

It was found that the majority of the publications in the AQ field were articles. All researchers attempt to publish their articles in high-level prestigious journals with high impact factors. The rank of a journal directly determines the relative importance of the published articles; therefore, the journals significantly impact the career expectations of the authors and are included in the scientific society (Lohmann and Eulerich, 2017). While book studies generally explain the current situation in a field, scientific articles add something new to a topic, prove a thesis, and make an author a pioneer in that field. Publishing on reputable journals and databases is beneficial for author citations and impact values. This explains the higher number of articles than books.

This study shows that research topics such as audit quality, audit fees, earning management were still important, but research topics such as corporate governance, auditing became less important. Additionally, it was seen that research topics such as audit committee, PCAOB, and financial reporting quality were popular in recent years. The findings of Uyar *et al.* (2020) stating that audit quality, audit fees, internal audit, financial reporting quality, and continuous audit keywords support the trend keywords in this study.

Although various countries around the world auditors established public oversight systems, PCAOB audit reports are the most commonly used reports to audit the firms registered both in the USA and outside the USA to determine the audit quality (Montenegro and Brás, 2018). However, efforts to investigate this topic were initiated in recent years and it was shown that regulative intervention will play a great role to share audit quality (DeFond and Zhang, 2014). Additionally, co-word network map was limited with the most effective 30 nodes. When the social network was analysed, it can be seen that work trends and the co-word network had matching research topics. In the studies, “audit quality” continues to be a focal point for multiple times. Less centric position of the PCAOB on the network supports that PCAOB-related research has been included in the social network in recent years.

In this study, the GC/LC ratio of DeAngelo (1981) and Becker *et al.* (1998) positively differentiates from other studies. The majority of the studies in the AQ field cited these studies. The reputation of Francis (2011) and DeFond and Zhang (2014) are relatively lower than other studies at the global level. It was seen that the first contribution in the highest publication number was by Francis J.R. in 1989. Additionally, Francis J.R. had 166 (1494/9) citations per publication in AQ field. However, it was seen that although DeAngelo L.E. as the author of the pioneering article entered to AQ field in 1981 with low productivity; the author received 1727 citations with one article. Gul F. A. had the highest score in all index values. It can be seen that Gul F. A. entered the field when AQ field was trending. This explains the relatively low LC number. The author-publication number and impact factor and collaboration analysis showed similar results. For example, Gul F. A. as the highest publishing author can be related to high collaboration numbers. Additionally, the high impact factor of Gul F. A. is related to collaboration. All index values assess the authors based on a number of publications and a number of citations. Thus, the view for the relationship between high collaboration and high citation numbers was supported. A similar

situation was valid for Raman K.K. as the most impactful node in the blue cluster and Chi W. as the most impactful node of the red cluster.

DeAngelo (1981)'s pioneering article can be clearly seen from "historical direct citation" analysis. Fundamentally, this analysis was developed to show how much the referenced sources are similar in the studies. It can be seen that Becker *et al.* (1998) was influenced by DeAngelo and impacted the field in a similar way. Balsam *et al.* (2003) especially impacted the publications close to today's date. It was seen that Francis who has the highest citation per publication used similar sources to Becker as a reference in multiple publications (Francis and Yu, 2009; Francis, 2011).

The highest cited country was clearly the USA and followed by Hong Kong in citation per publication. The dominance of the USA and Australia was supported by Öztürk and Yilmaz (2018) and Folador *et al.* (2018) mentioned the productivity of the USA. It was found that Holland, Canada, and the UK are leading in terms of citation per publication. Other than the native English-speaking countries, the average citation numbers of other countries with a low MCP ratio was low. However, although Australia is a native English-speaking country, the average citation number per publication was low. The top rank of the USA could be explained by the strong position in all best journals and being the most dominant country in the field (Merigo and Yang, 2017). On the other hand, The USA experiencing the first audit quality problem, having all global trade firms in the USA, having large capital and reputable audit firms in the USA, having the regulatory and standard institutions in the USA leads this country to have more publications than other countries. Within this scope, it can be seen that the USA was dominant in the red cluster, Australia was dominant in the blue cluster, Holland was dominant in the purple cluster and the UK was dominant in the green cluster. It is believed that high publication, average MCP value but low average citation number of Australia was caused by a lower collaboration level than the more impactful clusters. Thus, it can be seen that the quality of collaboration is important than the number of collaborations.

The findings of the study have discovered the orientation of the studies carried out to date. Therefore, the findings of the study can serve as a fundamental reference source for future studies. The study reflects the increasing and decreasing trends in the AQ field and provides insights to researchers, institutions, and firms for future studies. Additionally, the study contributes to presenting a general framework due to the increasing numbers of new publications. Also, the study helps to create a conceptual framework that is still discussed in the AQ field. The fact that this paper is the first bibliometric article in the field of AQ will give the researchers the opportunity to compare this study with their studies in AQ field. Also, it will be a resource for researchers to make new studies by evaluating the gaps in the field. In addition, the authorities can use the findings to create the framework of the regulations by examining the rising trends so they will increase the audit quality. This will also help to provide necessary training to auditors in this field. In this context, it is expected that the study will contribute more to researchers and authorities than practitioners.

This study has some natural and structural limitations. Massaro *et al.* (2016) as stated in their article on accounting research, there are some biases of literature reviews. Bibliometric research is insufficient to interpret the field from a general perspective rather than a detailed content analysis. To include the studies in the analysis, these studies must have "audit quality" terms in their title, keyword, and abstracts. This search limitation might lead to some studies investigating AQ field to be excluded. Additionally, social science

network publications in the English language on Scopus were considered. Studies with important findings in other languages, disciplines, and databases were excluded from the scope of this study. Future studies should consider the limitations of this study, and future studies have the potential to add a different perspective in the social and intellectual structure of AQ field.

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