

A Bibliometric Survey of Metadiscourse (1979-2023): Looking behind to Look Ahead

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EN Abstract: This paper aims to present the academic output of metadiscourse studies in terms of publication trends, journals, authors, and institutions; reveal the structure of scientific collaboration networks with regard to co-authorship, institutional and country cooperation; point out the robust research areas and promising research trends concerning metadiscourse. To meet this objective, the bibliometric records of metadiscourse-related publications are first retrieved from the Web of Science Core Collection. Then, the bibliometric analysis and social network analysis are employed to analyze the retrieved bibliometric databased with bibliometrix and VOSviewer. Our bibliometric analysis shows that the overall trend of metadiscourse-related publications has been on the increase, with a relatively slow growth before 2005 and two periods of rapid growth after 2005 and 2015. The most productive journal, author, institution and country are Journal of English for Academic Purposes, Ken Hyland, Hong Kong Polytechnic University, and China.

On the other hand, the social network analysis yields collaboration networks, and keyword-based co-occurrence networks. The collaboration networks show that author and institution collaboration networks are sparser than the country collaboration network. It also reveals that non-English speaking countries such as China and Spain have recently surpassed English-speaking countries and become main research hubs of metadiscourse research. The keyword-based co-occurrence network reveals metadiscourse research are mainly focused on academic discourse, with a focus on how interactional devices like stance and hedges are used in different genres through corpus and discourse analysis, primarily based on Hyland's interpersonal model. The year-overlaid co-word network sketches the evolution of genres from written discourse through spoken discourse to multimodal discourse, research approaches from genre analysis and discourse analysis to corpus analysis, research models from textual-interpersonal to interactive-interactional, and theoretical frameworks from contrastive rhetoric through pragmatics to systemic functional linguistics. Hence, the findings are expected to help orient novice researchers to metadiscourse studies, and offer the insights for future researcher to address the emerging issues of metadiscourse.

Keywords: metadiscourse; social network analysis; bibliometrix; VOSviewer.

Contents: 1. Introduction. 2. Literature review. 2.1. The concept of metadiscourse. 2.2. Classifications of metadiscourse. 2.3. Relevant Research. 3. Methodology. 3.1. Research Workflow. 3.2. Data source. 3.3. Research Methods. 3.4. Research Tools. 4. Results and Discussion. 4.1. Academic Performance. 4.1.1. Annual Publications. 4.1.2. Top Productive Journals. 4.1.3. Top Prolific Authors. 4.1.4. Top productive institutions and countries. 4.2. Scientific Collaboration. 4.2.1. Co-author Collaboration Network. 4.2.2. Academic Institution Collaboration Network. 4.2.3. Cross-country Collaboration Network. 4.3. Research Themes. 4.3.1. Most Frequently occurred Keywords. 4.3.2. Keyword Co-occurrence Network. 4.4. The Evolution of Research Themes. 5. Conclusion. Acknowledgements. CREDIT Authorship Contribution. References.

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1. Introduction

Metadiscourse, a widely used term in discourse analysis (Hyland, 2017), deals with the devices employed by the interlocutors or writers to structure the discourse, evaluate the proposition, express their attitudes, and

engage with the audience or the readers. This term, coined by the American structural linguist Zellig Harris in 1959, offers “a way of understanding language in use, representing a writer’s or speaker’s attempts to guide a receiver’s perception of a text” (Hyland 2005, p.3). Since then, interest in this concept has gained traction in applied linguistics and written communication. It has been adopted in discourse studies and approached from different perspectives in combination with other fields of language studies (Schiffrin, 1980; Williams 1981; Vande Kopple, 1985; Crismore & Farnsworth, 1989; Mauranen, 1993; Ädel, 2006; Hyland, 1999, 2004, 2017).

The growing interest in metadiscourse has brought in an abundance of metadiscourse studies. Some researchers have made valuable contributions to the literature review of metadiscourse, for example, the effect of disciplinary conventions and language context on the manifestation of metadiscourse markers in academic writing (Khedri et al., 2013), and signalling nouns (Flowerdew, 2015). These reviews are of great help in offering valuable insights through examining and consolidating metadiscourse studies; however, they are limited to specific metadiscourse topics, and employ a traditional method of literature review. Besides, a bibliometric analysis of metadiscourse has been conducted by Hyland (2017), which provides an excellent overview of metadiscourse studies. However, his research didn’t present the most productive authors, institutions or countries. It also didn’t investigate the academic collaboration network and illustrate the evolution of metadiscourse studies. Besides, his search term failed to take into consideration other spelling variants of metadiscourse; since a journal may be indexed in multiple academic databases, the publications retrieved from different search databases will have some duplicates and can’t accurately reflect the real scholarly output related to metadiscourse. The shortage of rigorous bibliometric analyses of metadiscourse, coupled with the increasingly growing proliferation of metadiscourse studies, makes it necessary to make a bibliometric analysis of metadiscourse.

In this paper we employ the method of bibliometric analysis to explore the literature on the field of metadiscourse studies over the past 45 years (1979-2023), with an aim to illustrate academic performance, examine academic collaboration networks, and identify research topics and their evolution during the years. Specifically, we address the following three research questions:

Question 1: What is the profile of the academic output of metadiscourse in terms of annual publications, journals, authors, institutions and countries?

Question 2: What is the social structure of scientific collaboration networks with regard to co-authorship, cross-institution and cross-country cooperation?

Question 3: What are the robust research themes and their temporal evolution concerning metadiscourse?

The remainder of the paper is structured as follows: the literature review section offers a brief literature review of metadiscourse definitions, its taxonomies and relevant studies; the following two sections deal with the research methodology, the results and discussion; the last section concludes by summarizing the key points and suggesting future directions for research on metadiscourse.

2. Literature review

2.1. The concept of metadiscourse

Metadiscourse, a widely used term in discourse analysis and academic discourse, refers to linguistic devices related to the text structure, the writer, and the imagined reader. However, due to its fuzziness, it is often understood in different ways and used to refer to different aspects of language use (Hyland, 2005). For instance, metadiscourse is considered as passages of a text which contain information of secondary importance from the perspective of information retrieval (Harris, 1970). However, Harris’s definition fails to specify the difference between linguistic expressions in metadiscourse kernels and other kernels. Later, metadiscourse is dealt with from a rhetorical and functional view and conceptualized as the discourse about the discourse (Williams, 1981; Crismore, 1983; Vande Kopple, 1985). Although they recognized the importance of speech act theory in the study of metadiscourse, they failed to integrate their work on metadiscourse into the larger framework for text studies provided by speech act theorists (Beauvais 1989). Therefore, with the framework of the speech act theory (Austin, 1962; Searle, 1969), metadiscourse is redefined as illocutionary force indicators that identify expositive illocutionary acts (Beauvais, 1989). Recently, metadiscourse is defined as the linguistic resources used to organize a discourse or the writer’s stance towards either its content or the reader (Hyland & Tse, 2004). In the meantime, metadiscourse is alternatively approached from the perspective of pragmatics (Ifantidou, 2005; Dafouz-Milne, 2008; Bu 2014), or conceived as a reflexive or metalinguistic function of language (Ädel, 2006; Ädel & Mauranen, 2010; Mauranen, 2023),

Although metadiscourse is a fuzzy area to some extent (Hyland, 2017), this does not mean there is no significance of revisiting the definition. On the contrary, the debates on metadiscourse help clarify different conceptualizations within different perspectives, deepen its theoretical understanding, expand its theoretical and practical applications, and enable researchers put forth a reasonable metadiscourse classification framework.

2.2. Classifications of metadiscourse

Given existing definitions on metadiscourse, different taxonomies of metadiscourse have been presented within three main theoretical frameworks: rhetoric-based, function-based, and pragmatics-based. Metadiscourse is first considered as a level of structure important in a description of style to serve the communicative intentions. It is classified into three broad common types: hedges and emphatics; sequencers and topicalizers; narrators and attributors; later, it was reclassified into three general types: advance organizers,

connectives, and interpersonal discourse (Williams, 1981). Recently, this classification is abandoned, and a new tripartite classification is adopted: the writer's intention, directions to the reader, and the structure of the text (Williams & Bizup, 2015).

Another classification put forth by Meyer (1975) was based on signaling, covering four major types. Some modifications are made on Williams' and Meyer's classifications and a new informational-versus-attitudinal typology is proposed (Crismore, 1983). Studies from the functional framework shed new light on the understanding of metadiscourse, particularly those associated with linguists such as Roman Jakobson and Michael Halliday. On the basis of Michael Halliday's three metafunctions of language (Halliday & Hasan, 1976; Halliday & Matthiessen, 2004), Vande Kopple (1985) refined Williams' classification and put forward a comprehensive classification of metadiscourse. Later, Vande Kopple's taxonomy of metadiscourse is refined into textual metadiscourse, and interpersonal metadiscourse (Crismore et al. 1993). Some researchers investigate the functions of metadiscourse from the reflexivity introduced in Lyons (1978), and classify metadiscourse into the following four categories: metalinguistic comments, discourse organization, speech act labels, and references to the audience (Ädel & Mauranen, 2010).

Metadiscourse is integral to the contexts in which it occurs and its effective use of metadiscourse is intimately linked to settings (Hyland, 1998). Hence, a perspective of pragmatics is taken to place metadiscourse in the settings which determine its use and give it meaning. Against this backdrop, Hyland's taxonomy (1998) follows the distinction of textual and interpersonal types (Crismore et al., 1993) and makes a finer reclassification. His textual metadiscourse consists of logical connectives, frame markers, endophoric markers, evidentials and code glosses, while interpersonal metadiscourse includes hedges, emphatics, attitude markers, relation markers, and person markers. Greatly inspired by the Thompson's conception of interactive and interactional resources (2001), Hyland and Tse (2004) reclassifies metadiscourse into interactive metadiscourse (transitions, frame markers, endophoric markers, evidentials, and code glosses) and inter interactional discourse (hedges, boosters, attitude markers, engagement markers, self-mentions). However, the non-propositional or non-truth-conditional distinctions (Vande Kopple, 1985; Hyland, 1998, 1999; Hyland & Tse, 2004) are criticized by Ifantidou (2005) for their fuzzy boundaries, especially Hyland's distinction between textual and interpersonal metadiscourse (Hyland, 1998, 1999). Ifantidou (2005) places the classification of metadiscourse within the theoretical framework of relevance theory (Sperber & Wilson, 1995), proposing a new classification of metadiscourse between inter-textual and intra-textual metadiscourse. Recently, Bouziri (2021) combined the reflexive approach and the interpersonal approach, proposing a tripartite metadiscourse which covers three dimensions (organizing, involving/evaluative, and bi-dimensional) to investigate academic lectures.

In short, the in-depth inquiry into the definition of metadiscourse and attempt to find a reasonable taxonomy of metadiscourse reflect the different perspectives taken to probe the ubiquitous metadiscourse, enable researchers to find alternative approaches to explore or examine metadiscourse. Given the ongoing and unresolved debates and criticism about the definition and classification of metadiscourse, it is important to conduct a comprehensive and systematic review of published research on metadiscourse.

2.3. Relevant Research

Prior studies have employed a variety of methods to examine the research landscape of the metadiscourse field. For instance, Khedri et al. (2013) studied 9 relevant peer-reviewed empirical articles out of 50 articles retrieved from two electronic database (Oxford Academic and Scencedirect) from 1990s to 2010s, with an aim to survey the evidence of the influence of disciplinary conventions and the linguistic background on the manifestation of metadiscourse markers in academic writing. They found that the common belief was supported that metadiscourse is a rhetorical device which can distinguish academic disciplines and languages from each other. They also pointed out that the manifestation of metadiscourse is constrained and conditioned by disciplinary practices and writing cultures.

Later, Hyland (2017) expanded the search scope to three major academic databases to present the patterns of publication of metadiscourse work in the time range from 1988 to 2016. He conducted a state-of-the-art analysis to identify the research topics based on the keywords of 139 papers. The findings indicated that research has a heavy privilege to written academic texts and discourse-analytic procedures, and the term "metadiscourse" has a broad and interactional definition.

Besides, D'Angelo and Consonni (2020) employed a narrative literature review to offer an overview of previous research on metadiscourse. They summarized that there were three waves of metadiscourse studies and pointed out a new wave of metadiscourse lied in the digital communication. Hyland et al. (2022) also used the similar method to review the metadiscourse field across languages and genres to further examine the recent facets of metadiscourse conceptions, directions and genres. They found that metadiscourse studies have been particularly productive in the investigation of contextual constraints on writing, especially academic discourses, and uncovering differences between genres, disciplines, languages, linguistic proficiencies and time intervals.

In a recent study, Pearson and Abdollahzadeh (2023) adopted the systematic review to examine the landscape of metadiscourse research in academic writing. Based on the analysis of 370 empirical studies published between 1990 and 2021, they found that the broad conceptions of metadiscourse were dominant and the majority of research drawn on intercultural rhetoric to make a corpus-based, cross-sectional descriptive analysis of metadiscourse.

Previous studies have provided a valuable summary of metadiscourse research and deepened our further understanding of research trends in the field of metadiscourse. However, some of these studies have

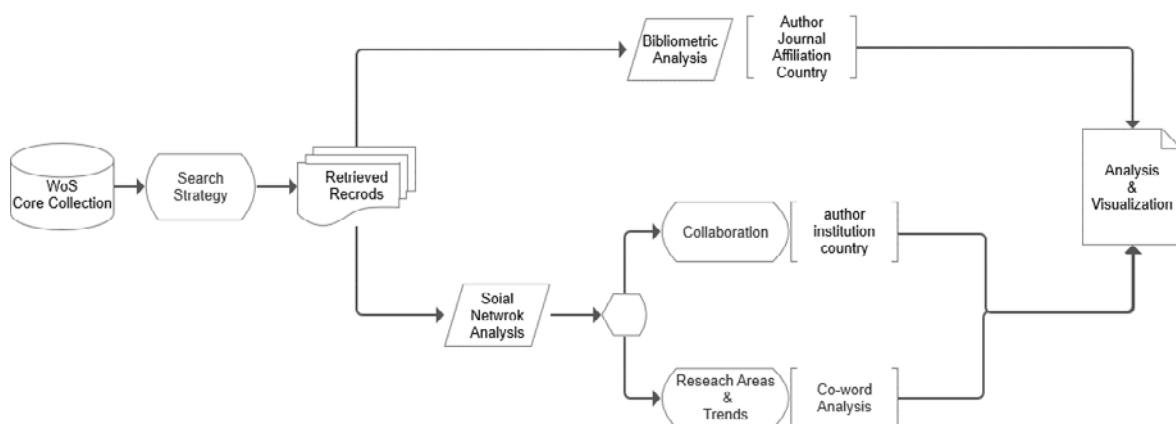
focused on research themes in a specific field in metadiscourse research, such as academic writing (Pearson & Abdollahzadeh, 2023), and some studies have adopted the traditional literature review and failed to sketch the whole landscape of metadiscourse studies in an objective and systematic manner (D'Angelo & Consonni, 2020; Hyland et al., 2022). Though some researchers made a bibliometric analysis of the field of metadiscourse, they either had a limited dataset or failed to investigate the academic collaboration network and trace the evolution of metadiscourse studies (Khedri et al., 2013; Hyland, 2017). Therefore, it is necessary to make a systematic analysis of the field of metadiscourse research based on recent literature to profile its academic performance, examine its academic collaboration network, and identify its research themes and trace the evolution of research topics.

3. Methodology

3.1. Research Workflow

The research workflow has four major steps which is diagrammed in Figure 1. First, the Web of Science database was employed to conduct a bibliometric analysis of metadiscourse research to examine its academic performance in terms of annual publications, top productive journals, authors, affiliations and countries. Then, the academic output of metadiscourse is profiled. The following step is to explore the structure of scientific collaboration networks with the help of the software VOSviewer. The last step is to identify the research areas, and visualize the temporal evolution of research areas.

Figure 1. Metadiscourse Research Workflow



3.2. Data source

The Web of Science (WoS) Core Collection is used to collect bibliometric information about the metadiscourse literature, because the WoS database is regarded as a high-quality academic search database for the analysis of scientific publications in various disciplines (Wang & Waltman, 2016; Li, Rollins, & Yan, 2018). The WoS Core Collection consists of ten indexes containing information gathered from different publications, four indexes (the Social Sciences Citation Index, Arts and Humanities Citation Index, Conference Proceedings Citation Index-Social Sciences & Humanities, and Emerging Sources Citation Index) are selected because metadiscourse is closely related to the three academic disciplines (arts, humanities, social sciences). The earliest indexed record in the four indexes dates back to the year 1979, so the time span is set between 1979 and 2023. Additionally, taking into account the different spelling variants search term metadiscourse (for example, meta-discourse, meta discourse), the search strategy used here is as follows to collect all indexed scholarly articles available: {TOPIC: ("meta discoursesm") OR TOPIC: (metadiscours*) OR TOPIC: (meta-discours*) Timespan: 1979-2023. Indexes: SSCI, A&HCI, CPCI-SSH, ESCI}.

The search strategy returns a total of 992 article records which consist of 7 document types, with the article type ranked first. Given our focus on research articles, four document types (the book-review, editorial material, book chapter and poetry) are removed from the bibliometric records, the remaining 953 bibliometric records are used for further processing in the two software tools (bibliometrix and VOSviewer). Table 1 shows a breakdown of document types and their corresponding counts. Articles are the most common document type (869), followed by proceedings papers (79).

Table 1. Publication Types

Document Types	Counts
Article	869
Proceedings Paper	79
Early Access	18
Review Article	16

3.3. Research Methods

The objective of this paper is to survey the scholarly productivity of metadiscourse, identify and visualize the research trends and characteristics of metadiscourse studies over the last 45 years. The two approaches of bibliometrics and social network analysis are employed with the help of the two freely available software tools bibliometrix and VOSviewer.

Bibliometrics, also called bibliometric analysis, is a popular and rigorous method used to explore and analyze large volumes of scientific data by quantifying and analyzing factors such as the annual publication, authors, sources, citations, and institutions or countries of the relevant literature. Compared with the traditional literature review, it has the advantage of introducing a systematic, transparent, and reproducible review process based on the statistical measurement of science, scientists, or scientific activity (Ellegaard & Wallin, 2015). Furthermore, it can characterize the development in a research field and snapshot the development in a research field or a specific journal. It has two major components: performance analysis and science mapping. The former is often used to evaluate academic productivity and impact as well as scholarly contributors in the field. The latter is used to uncover key research themes and topics, demonstrate the topical evolution and reveal the research gaps in the field (Donthu et al., 2021; Mukherjee et al., 2022).

Given the fact that bibliometrics can provide an objective, reliable and quantitative analysis, this analytical technique is often employed in systematic literature reviews to track author or scholar output and impact, identify research topics or hotspots, sketch the evolutionary path of a field in a wide range of disciplines (Chen and Xiao 2016; Tao, Ding, and Ho 2018). This method has already been employed to investigate different research topics in a plethora of academic subject areas in the last few years (Garousi & Mantyla, 2016; Leung et al., 2017; Thompson & Walker, 2015; Hyland, 2017).

Another method is social network analysis (SNA) which is an effective technique to evaluate the importance of nodes and reveal the network structure based on the premise that the relationships between units interpreted as a graph (Chen & Xiao, 2016). Instead of just looking at individual publications, SNA allows researchers to examine the bigger picture by visualizing the connections between authors, institutions, keywords, and even research topics as a network. A variety of bibliometric networks, such as co-authorship networks, bibliographic coupling networks, and co-citation networks, can be created employing such network tools as Pajek, VOSviewer, or Gephi.

3.4. Research Tools

The two research tools employed in the study are bibliometrix, an open-source bibliometric R package, and VOSviewer, a freely available visualization software tool, to survey and visualize the bibliometric publications related to metadiscourse studies. These two tools allow researcher to import bibliographic data from various sources like Scopus, Web of Science, PubMed, and others. The R package bibliometrix is designed to perform comprehensive science mapping analysis, with a high flexibility and a seamless integration with other statistical R packages to support statistical operations (Aria & Cuccurullo, 2017). This package provides a wide range of functions to help researchers conduct bibliometric analyses. It offers functions like *biblioAnalysis* to calculate key bibliometric measures which includes things like annual publication counts, top cited articles, most productive authors and countries, and analysis of relevant keywords and sources (journals). It provides information such as the top productive authors, institutions and countries as well as annual publications.

VOSviewer is an excellent visualization tool developed by Nees Jan Van Eck and Ludo Waltman (van Eck & Waltman, 2010) to construct and visualize bibliometric networks between keywords, authors, or organizations in a literature search. It is used to visualize the collected data and construct the science-mapping of co-author network (a network used to visualize and understand collaboration among researchers), co-occurrence network (a network revealing patterns and trends in a specific discipline by focusing on how frequently keywords or terms appear together), and institutional cooperation (a network used to visualize and understand collaboration among institutions).

4 Results and Discussion

4.1. Academic Performance

Based on the methodology as described in the previous section, a bibliometric database on metadiscourse consisting of 953 publications was included for further analyses. Detailed information about this database is provided in Table 2.

Table 2. Main Information about Data

Description	Results
Time Period	1979-2023
Sources (Journals, Books, Etc)	430
Annual Growth Rate %	5.87
Document Average Age	7.42
Average Citations Per Document	13.66

Description	Results
References	28, 231
Authors	1, 369
Authors of Single-Authored Documents	403
Co-Authors per Doc	1.77
International co-authorships %	16.89
Keywords Plus (ID)	789
Author's Keywords (DE)	2, 523

The 953 publications are written in a total of 16 languages because the WoS Core Collection also indexes journals published in languages other than English. For instance, the journals *Estudios Filológico* and *Argumentation Et Analyse Du Discours* are respectively published in Spanish and French. Table 3 shows the top 5 languages used in the metadiscourse-related publications. As expected, the most common language is English (875 documents), followed by Spanish (37 documents) and French (34 documents). This highlights the great importance of English in the scholarly communication, due to the dominant position of English as a lingua franca in the international academic community.

Table 3. Top 5 Languages

Language	Counts
English	875
Spanish	37
French	34
German	13
Russian	11

In order to answer Question 1, the bibliometric analysis will profile the academic output of metadiscourse studies with reference to annual publications, top productive journals, prolific authors, and top productive institutions.

4.1.1. Annual Publications

A detailed bibliometric analysis is made to track the annual publication trends related to metadiscourse research. Figure 2 shows the yearly publication trends in the field of metadiscourse studies in the past 45 years. The overall trend of metadiscourse-related publications has been on the increase. It can be roughly divided into four phases: foundation (1979-1995), establishment (1996-2005), growth (2006-2015), and surge (2016-2023).

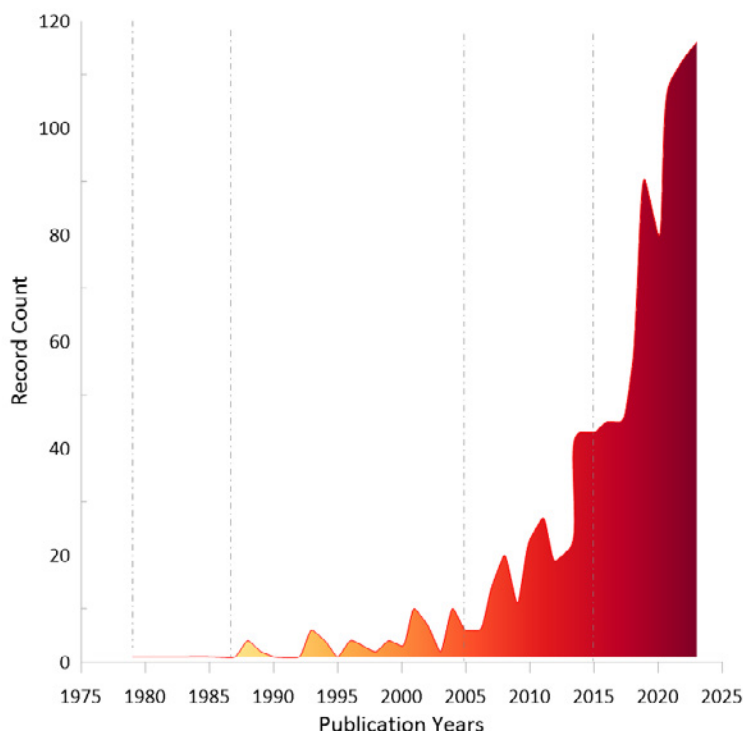
In the foundation phase, the number of publication records is 24. USA has the largest number of publications (16), followed by Canada (3) and Netherlands (2). Avon Crismore, William J. VandeKopple, Paul J. Beauvais are the early scholars whose works help clarify the definition of metadiscourse. This lays a solid foundation for the classification of metadiscourse and paves the way for the ensuing studies.

In the second phase, the number of publication counts has doubled to 48. USA is still the largest contributor (12), followed by England (10) and China (5). Ken Hyland and Anna Maurannen are the main contributors who shape the two commonly used metadiscourse approaches: the broad or integrative approach which emphasizes the interpersonal aspect, and the narrow or non-integrative approach which focuses on the metatext or discourse reflexivity.

In the growth phase, metadiscourse studies have received much attention from the academic community, reaching a record of 227. USA (61) is the largest contributor, followed by Spain (27) and Iran (21). Ken Hyland and his collaborator Polly Tse proceeds with high academic output. Other researchers from Iran (e.g., Davud Kuhi, Guangwei Hu) also focus their research on the field of metadiscourse studies. The sudden increase after 2005 maybe lie in the the publication of two major books on the topic, Adel's (2006) *Metadiscourse in L1 and L2 English* and Hyland's (2005) *Metadiscourse*, which have had a significant impact on metadiscourse studies (Hyland & Jiang, 2022).

In the surge phase, the number of publications almost triple, reaching a new record of 654. China, with a number of 147, surpasses USA (76) and becomes the largest contributors. Another main contributor is Spain which has 75 publications. It can be inferred that the surge in the publications can be accounted for by the great interest of researchers from non-English-speaking countries.

Figure 2. Annual Publication Counts



4.1.2. Top Productive Journals

It is important for novice researchers to know how to select the journals that publish metadiscourse research to read when a literature review is performed. Table 4 presents the top 10 journals that have published most research articles on metadiscourse. It can be seen that the *Journal of English for Academic Purposes (JEAP)* has published more metadiscourse studies than any other journal. What comes next is the *Journal of Pragmatics* and *English for Specific Purposes (ESP)*. This concentration on English academic and specific genres reveals the predominant focus of metadiscourse studies on English academic and professional texts. To some extent, the concentration of pragmatics shows many metadiscourse studies mainly adopts pragmatic perspectives to gain a deeper understanding of how metadiscourse works in the real language settings, which can be confirmed in the coming analysis of research themes. It also reflects that the *Journal of Pragmatics* welcomes papers which use real-world language data to explore how language and context connect.

It is a surprise that the total citations in the journal *English for Specific Purposes* outnumber those in the *Journal of English for Academic Purposes*, although the two journals have a similar number of publications. The explanation may lie in the *ESP*'s wider scope of coverage than in *EAP* in that the former publishes the articles relevant to occupational or otherwise specialized communities as well as academic ones. The rest of the journals seek to span related disciplines such as linguistics and communication (*Ibérica, Text & Talk, Discourse Studies, Circulo de Linguistica Aplicada a la Comunicacion*), linguistics and education (*Lingua, System, Gema*)

Table 4. Top 10 Productive Sources

Source	NP	TC	h-index	PY_Start
Journal of English for Academic Purposes	44	915	18	2010
Journal of Pragmatics	42	2085	20	1998
English for Specific Purposes	38	1182	18	2001
Ibérica	20	186	7	2008
Lingua	15	93	7	2018
Text & Talk	14	95	6	2006
System	12	160	8	2014
Discourse Studies	11	240	8	2005
Gema: Online Journal of Language Studies	11	30	3	2019
Circulo de Linguistica Aplicada a la Comunicacion	10	4	1	2018

Note: NP = Number of publications, TC = Total citations, PY_start = Publication year starting

4.1.3. Top Prolific Authors

The investigation of the most prolific authors in a research field is of great benefit to identify scholars who have made great contributions to their research fields. Table 5 shows that out of 1369 authors, who are contributing to the metadiscourse database, 1176 authors (85.9%) have only one publication. This reveals the highly skewed distribution of publication among the authors highly skewed and is basically in line with Lotka's law which is named after Alfred J. Lotka and is often used to explain the frequency distribution of scientific productivity and how many publications authors tend to have in a specific field. Specifically, the number of authors who publish a certain number of articles is inversely proportional to the square of that number of articles. In simple terms, a relatively small number of authors are very prolific, publishing many articles while a much larger group of authors publish a smaller number of articles. This unequal distribution demonstrates that the vital few authors (e.g., Ken Hyland, Maria Luisa Carrió-Pastor) have contributed the most publications concerning metadiscourse studies.

Table 5. Top 10 Prolific Authors

Author	NP	TC	h_index	PY_start
Hyland, Ken	24	2340	15	1996
Carrió-Pastor, María Luisa	14	45	4	2015
Jiang, Feng	13	262	8	2015
Hu, Guang Wei	11	446	8	2011
Kuhi, Davud	7	69	4	2011
Cao, Feng	6	350	4	2011
Buckingham, Louisa	6	46	4	2018
Ho, Victor	6	89	5	2016
Khedri, Mohensen	6	64	3	2013
Dong, Jihua	6	26	3	2018

Note: NP = Number of publications, TC = Total citations, PY_start = Publication year starting

Table 5 lists the top 10 productive authors who have shaped the academic research on metadiscourse. It is obvious that Ken Hyland tops the list with the largest number of both publications and citations as well as the highest h-index. This suggests that Hyland is the most productive and most influential scholar in metadiscourse studies, followed by María Luisa Carrió-Pastor, Feng Jiang and Guangwei Hu. Although Davud Kuhi is ranked ahead of Victor Ho and Feng Cao in the number of publications, he is less influential than them. The high citations of Feng Jiang and Feng Cao can be probably explained by their co-authorship with Hyland and Guang Wei Hu respectively since a star collaboration affects academic productivity and influence (Betancourt et al., 2023; Yadav et al., 2023).

Figure 3. Top 20 Authors' Scientific Productivity over Time

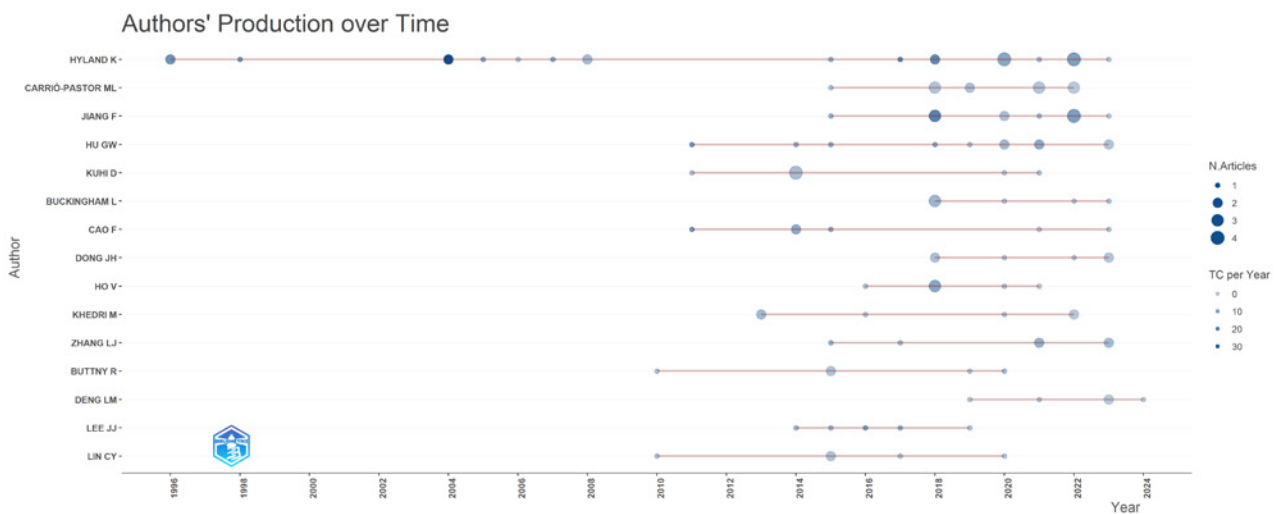


Figure 3 depicts the top 15 authors' productivity in metadiscourse studies over the years. From this figure, it can be found that K. Hyland has been actively engaged in metadiscourse research since 1996. Besides, some

scholars (Guangwei Hu, María Luisa Carrió-Pastor, Cao Feng, Jiang Feng, and Mohsen Khedri) have been actively working in this field since the last decade. It also reveals that some researchers (Louisa Buckingham, Jihua Dong, and Liming Deng) are emerging researchers in the metadiscourse field. Their recent studies are mainly focused on persuasions in specialized communities, stance in academic writings, meta-discursive nouns in academic writings, identity in academic writings, etc. In addition, it seems that some researchers (e.g., Davud Kuhi, Richard Buttny, Chia-Yen Lin) have been less actively engaged in metadiscourse studies.

4.1.4. Top productive institutions and countries

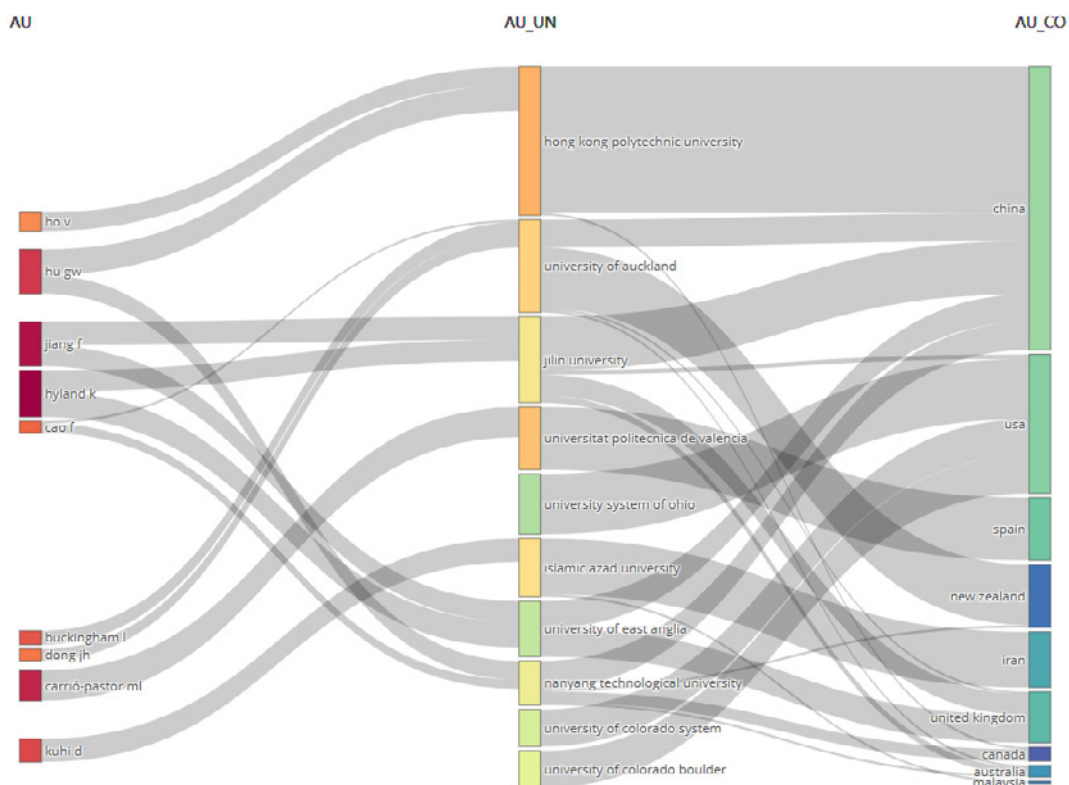
Table 6 shows the top 10 most productive institutions and countries based on the number of publications. With regard to the productivity of top institutions, the metadiscourse research is not equally distributed, ranging from 26 publications to 10 publications. The most productive institution is Hong Kong Polytechnic University, followed by Universitat Politecnica de Valencia, University of Auckland and Jilin University. Islamic Azad University and University of Nanyang Technological University are tied for the fifth place. The following one is University of Colorado Boulder. The last two universities are and University of Zaragoza and Universiti Putra Malaysia. This reflects that these 10 institutions make great contributions to this field of metadiscourse.

Table 6. Top 10 institutions and countries in terms of the number of publications

Institutions	NP	Country	NP
Hong Kong Polytechnic University	26	China	249
Universitat Politecnica De Valencia	18	USA	201
University of Auckland	17	Spain	129
Jilin University	16	United Kingdom	96
Islamic Azad University	14	Iran	73
Nanyang Technological University	14	Australia	57
University of Colorado Boulder	13	Malaysia	36
University of East Anglia	12	New Zealand	32
University of Zaragoza	10	Canada	31
Universiti Putra Malaysia	10	Germany	30

Note: NP= number of publications

Figure 4. Top 10 Productive Institutions with regard to authors and countries



As to the scientific productivity of top countries in metadiscourse studies, China is ranked first. What comes next is the United States, Spain, the United Kingdom and Iran. The rest are Australia, Malaysia, New Zealand, Canada, and Germany. One important observation is that such non-English speaking countries as China and Spain have more scientific productivity in metadiscourse studies. However, the overall landscape of metadiscourse research is still dominated by English-speaking countries. It can be seen that the majority of publications are published by scholars from the five English-speaking countries (USA, United Kingdom, Australia, New Zealand, and Canada).

Figure 4 shows the greatest contributions made to top 10 academic institutions in terms of authors and countries. The area of these colored rectangles represents the share of contributions made. These 10 institutions are located in 9 countries, with 9 researchers being leading contributors. For example, K. Hyland is the main contributor to University of East Anglia in the UK. In China, Feng Jiang and Guangwei Hu are the two largest contributors to Jilin University and the Hong Kong Polytech University respectively. D. Kuhl is the main contributor to the Islamic Azad University in Iran. Maria Luisa Carrió-Pastor is the top productive scholar affiliated to Universitat Politècnica de València in Spain. Besides, one important observation is that the three universities in the United States have no leading scholars.

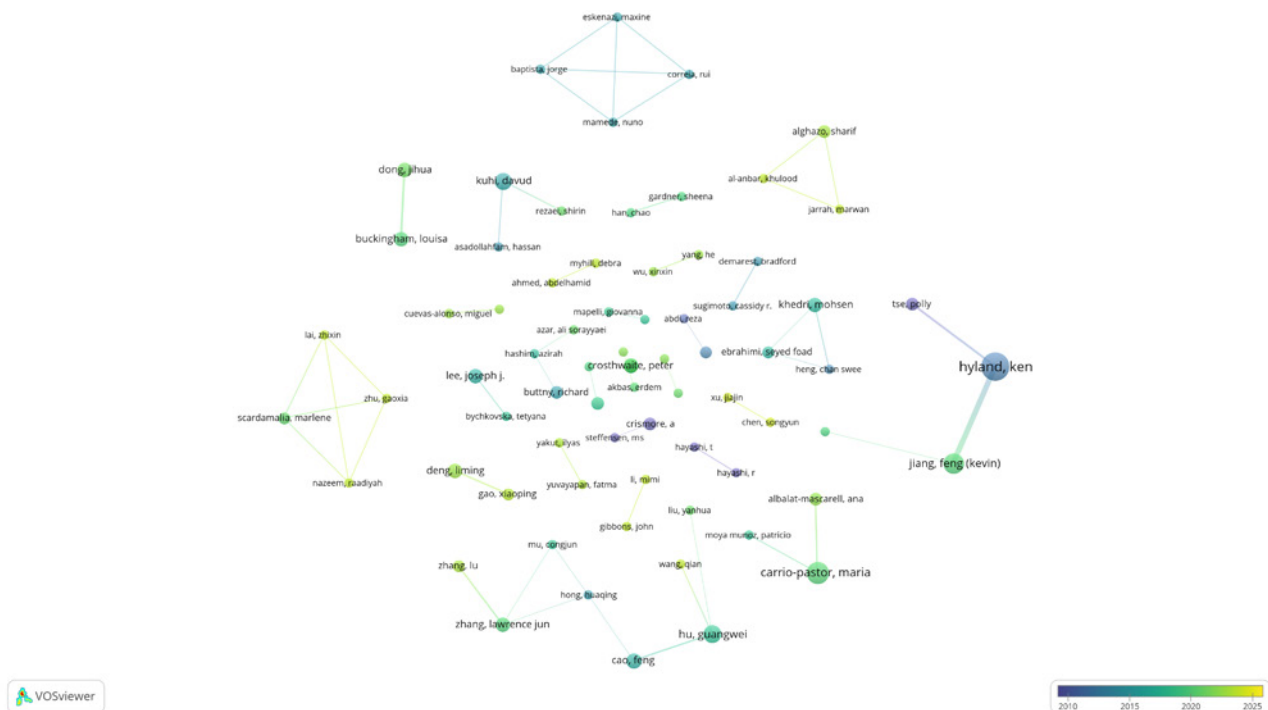
4.2. Scientific Collaboration

Scientific collaboration is conducive to the exchange of academic thoughts, the spread of knowledge, and the sharing of resources. Hence, this subsection attempts to employ the visualization software VOSviewer to identify the structure of scientific collaboration in metadiscourse research to answer Question 2 proposed in Section 3. This section will present the following three collaboration network: co-author, academic institution, and country. For each unit of analysis, its total link strength with its counterpart will be calculated, and those without the total link strength will be removed.

4.2.1. Co-author Collaboration Network

As one of the most tangible and well documented forms of scientific collaboration, co-authorship can reliably track almost every aspect of scientific collaboration network with the help of bibliometric methods (Glänzel & Schubert, 2004). Generally speaking, in the co-authorship network, the nodes represent authors, the links represent co-authorship between authors. Figure 5 displays a simplified author collaboration network with the minimum number of documents of an author set at 2, which filters out 175 authors. After removing those without total link strength, 136 authors meet the criteria.

Figure 5. Year-Overlaid Author Collaboration Network of Metadiscourse Studies



Note: weights (circle sizes) measured by documents, and scores (colors) by average publication years

Overall, the collaboration network is relatively sparse and has a large number of small connected components. The largest connected component has 8 researchers who fall into two clusters: one cluster led by Guangwei Hu includes Feng Cao, Qian Wang, and Yanhua Liu; the other one led by Lawrence Jun Zhang consists of Congjun Mu, Lu Zhang and Huaqing Hong. To some degree, this reflects a situation where there's

a lack of strong connections and extensive collaboration between individuals or groups in metadiscourse studies, which may restrict the information and expertise within these small, isolated group or cause the duplication of research on similar problems and potentially miss opportunities for synergy.

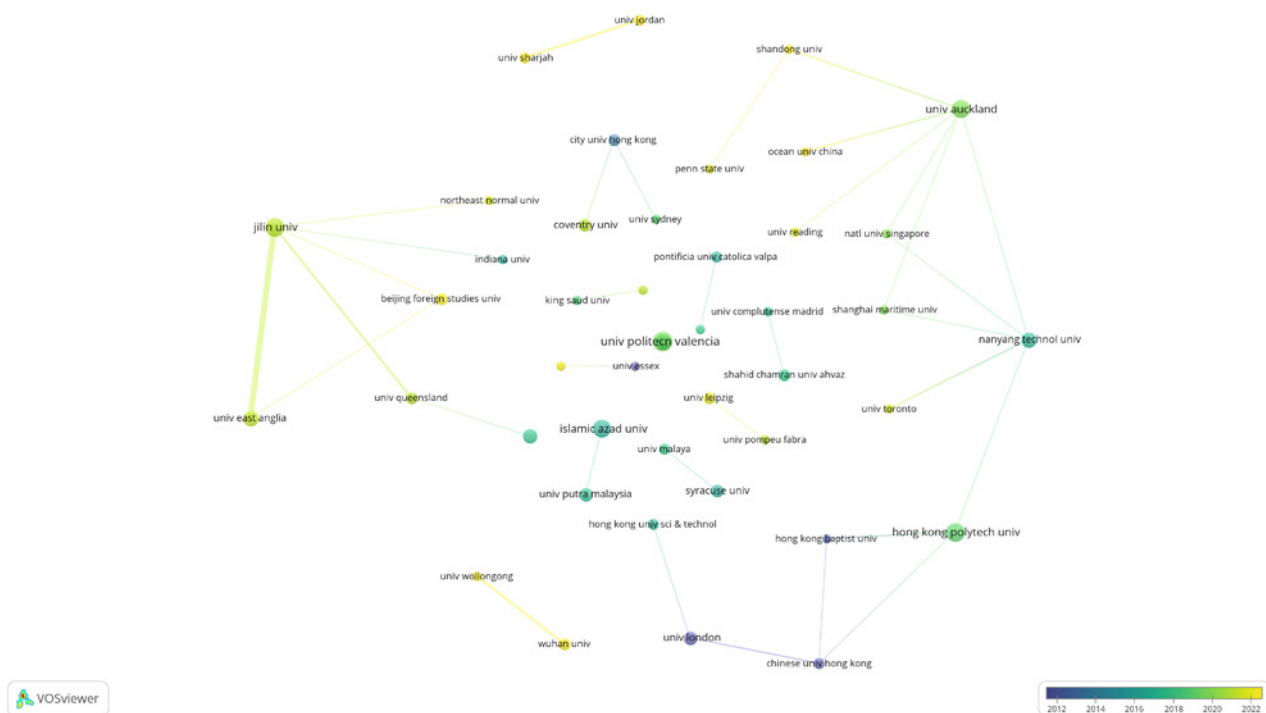
In addition, this figure also demonstrates that the author collaboration network has 4 cliques where every researcher is connected to everyone else. Two cliques have four members. The first four clique includes Jorge Baptist, Maxine Eskenazi, Nuno Mamede, and Rui Correia. The other one consists of Mariene Scardamalia, Gaoxia Zhu, Zhixin Lai, and Raadiyah Nazeem. The other two cliques have three members. One involves Mohsen Khedri, Seyed Foad Ebrahimi, and Chan Swee Heng. The other cluster has Sharif Alghazo, Khulood Al-anbar, and Marwan Jarrah. The cliques help build a high-performance team, which in turn enables them to share academic resources and enhances their research output.

With regard to co-authored documents, the most productive collaboration network consists of Ken Hyland, P. Tse, Feng Jiang, and Jingjing Wang. It means that their co-authored publications have exerted a strong impact on the metadiscourse research, with Ken Hyland serving as a central figure. What follows next is the network formed by Maria Carrio-Pastor and her two collaborators. Additionally, this year-overlaid collaboration network reveals some productive research teams in recent years, such as the teams led by Jihua Dong, Liming Deng and Peter Crosthwaite. To some extent, the well-knit research collaboration explains why these researchers are so productive.

4.2.2. Academic Institution Collaboration Network

Figure 6 displays an institution collaboration network with the minimum number of documents of an institution set at 3, which filters out 75 institutions. Just like the co-author network, the cross-institution collaboration network is also sparse. The largest connected network consists of 14 institutions which are bridged by three productive universities (Nanyang Technological University, Hong Kong Polytech University and University of Auckland). They occupy the structural hole positions and serve as research hubs for the academic production of metadiscourse studies.

Figure 6. Year-Overlaid Cross-Institution Collaboration Network of Metadiscourse Studies



Note: weights (circle sizes) measured by documents, and scores (colors) by average publication years

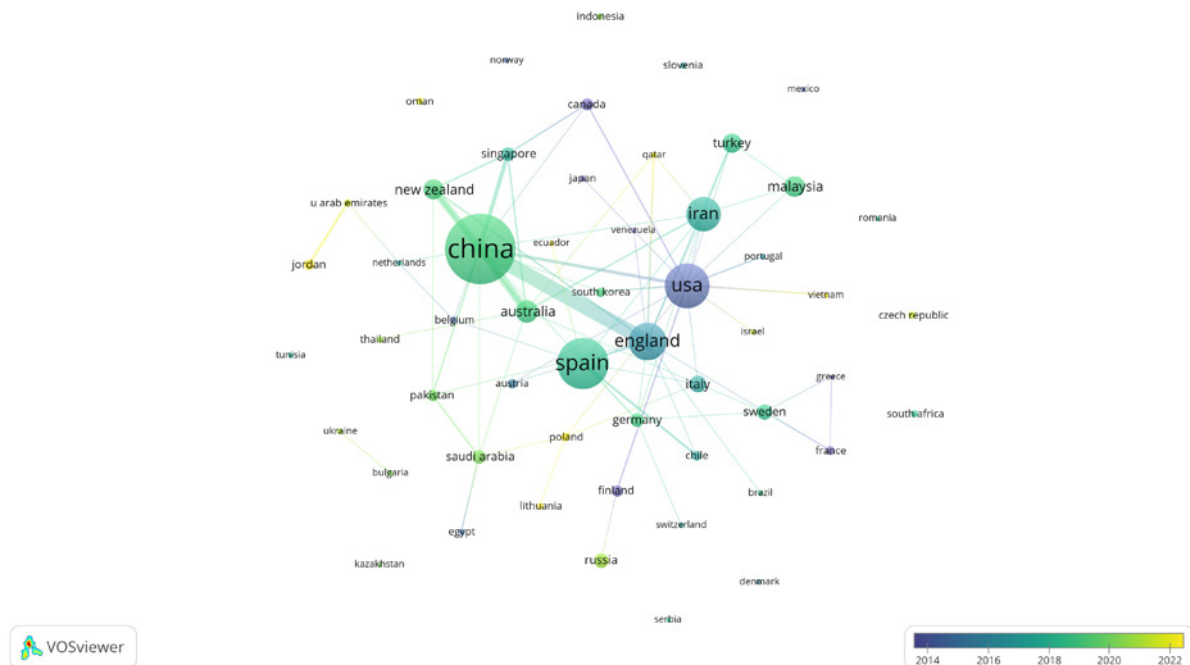
The next closely connected one consists of 7 institutions, with Jilin University acting as the research hub, connecting such universities as University of East Anglia, University of Queensland, and Beijing Foreign Studies University. Additionally, the year-overlaid co-institutional network reveals that Chinese universities are recently becoming main academic producers of metadiscourse studies.

4.2.3. Cross-country Collaboration Network

There are a total of 71 countries in the 953 publications. Figure 7 displays the science mapping of cross-country collaboration with the minimum number of documents of a country set at 2, with 54 countries meeting the threshold. The largest connected component consists of 40 countries. It can be observed that the cross-country collaboration network is denser than the previous co-author and cross-institution collaboration network.

With regard to publication years, the English-speaking countries (e.g., USA and England) were previously research collaboration leaders and at the center of knowledge production in the field of metadiscourse. However, such non-English speaking countries as China and Spain have recently stood out, overtaking these English-speaking countries and becoming main research hubs of metadiscourse research. The change may be partly accounted for by the successful implementation of their governments and universities' research policy and engagement with internationalization of the research (Zhang et al., 2021; Rodríguez-Navarro & Brito, 2022).

Figure 7. Overlay visualization of cross-country collaboration



Note: weights (circle sizes) measured by documents, and scores (colors) by average publication years

In terms of the number of co-authored publications, there is a thick line connecting China and England, which suggests a strong research collaboration between the two countries. There are also lines connecting China to other English-speaking countries, including the United States, Singapore, New Zealand, and Australia. This suggests that China has a close collaborative research relationship with English-speaking countries. Another important cross-country collaboration is dominated by Spain has a frequent collaboration with both European countries and countries in Latin America. However, some countries in central and eastern European (e.g., Czech Republic, Slovenia, Romania, Ukraine), Asia (e.g., Indonesia, Thailand, Oman), Latin America (e.g., Mexico) and Africa (e.g., Tunisia and South Africa) lie in the periphery of the cross-country collaboration network, with no collaboration with the above-mentioned main contributors. It also reveals that international collaboration is a key factor that exerts a great influence on the scientific productivity.

4.3. Research Themes

Co-word and co-citation analyses are often used to explore the intellectual structure of a certain research field or discipline (White & McCain, 1998; Boyack et al., 2005; Ronda-Pupo & Guerras-Martin, 2012). However, co-citation fails to provide an immediate picture of the actual content of the research topics dealt with in the literature. (Ding, Chowdhury, & Foo, 2001). Hence, the co-word analysis is employed in the study to map the intellectual structure of metadiscourse studies. This analysis is based on the assumption that keywords in a publication constitute an adequate description of its contents, and two keywords co-occurring within the same publication are an indication of a link between the topics to which they refer (Cambrosio et al., 1993; Callon et al., 1983). Their association strengths are statistically measured to identify the research patterns and thematic trends in a journal or a research area.

4.3.1. Most Frequently occurred Keywords

Out of the 953 publications during the years 1979-2023, there are 2523 author keywords in total. The distribution of these keywords is highly right-skewed, with 2072 keywords (82.12%) occurring only once, 242 keywords (9.59%) twice, and 77 keywords (3.05%) three times. It is no doubt that the most frequently used keyword is metadiscourse. It is also found that some keywords are different in the grammatical number usage, for example, research article and research articles; some use similar keywords, for example, "genre" versus "genre analysis", "corpus" versus "corpus linguistics". Since the focus of this study is on metadiscourse research, the keyword "metadiscourse" bears little meaning in the keyword list and is removed. After further

processing, the most frequently used five keywords are “academic writing”, “genre analysis”, “interactional metadiscourse”, “research articles” and “corpus analysis”.

Table 7. Top 20 most frequently used author keywords

Author Keyword	Occurrences	Author Keyword	Occurrences
academic writing	97	persuasion	23
corpus analysis	47	boosters	22
research articles	47	EAP	20
interactional metadiscourse	44	engagement	20
stance	36	interpersonal model	20
discourse analysis	35	discourse markers	17
hedges	32	interactive metadiscourse	17
academic discourse	31	evaluation	15
genre analysis	30	abstracts	14
metadiscourse markers	26	multimodality	13

Table 7 presents the top 20 frequently used keywords. These keywords uncover the following research themes in research genres, research approaches, major devices, and major models. The main focus of metadiscourse is on academic discourse, especially academic writing since understanding genre-specific features helps authors tailor their writing to the expectations of their audience.

The main research approaches used are corpus analysis, discourse analysis, and genre analysis. These approaches allow them to not only identify metadiscourse features but also explain how they contribute to the overall message and impact of a text within a specific genre. Corpus analysis enables researchers to examine a large collection of texts, helping them quantify the use of metadiscourse features, identify frequent metadiscourse markers and explore their usage patterns. Discourse analysis goes beyond the surface meaning of words to examine how language functions in a social context. It allows scholars to examine how authors structure, position themselves within the text, and engage with the reader. This will help understand how metadiscourse features function within the broader context. Genre analysis is textual analysis, offering deep descriptions of academic discourse by focusing on specific genres as well as producing generic structures of moves. It provides the context for interpretation, and enables researchers to see how authors in different genres employ these features to achieve their goals.

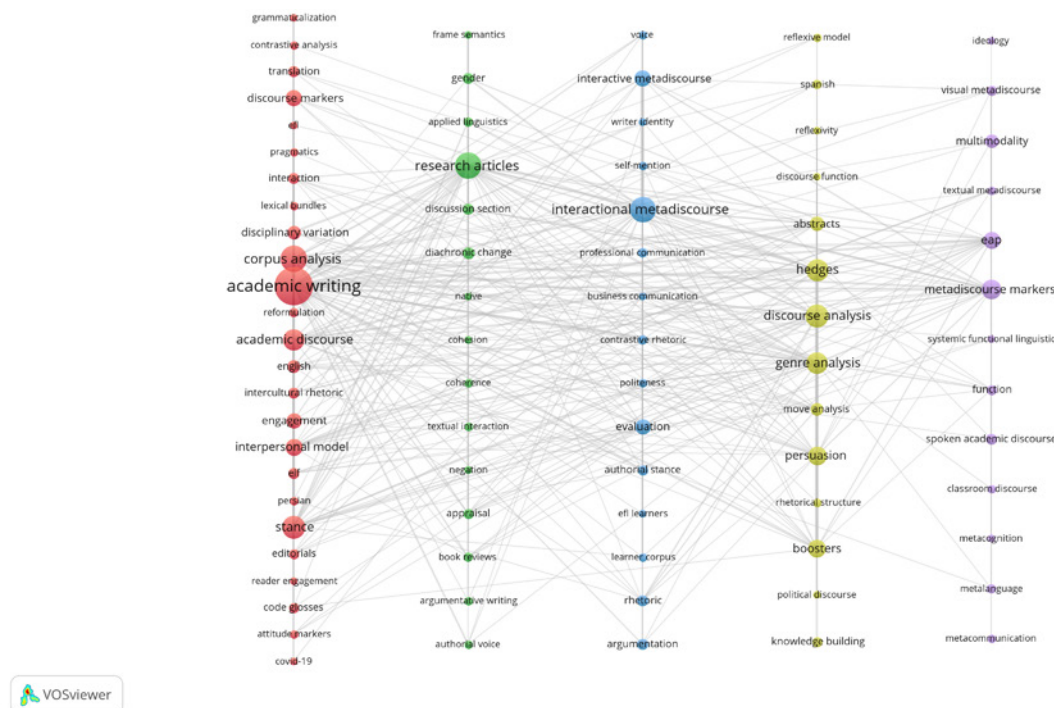
The major devices investigated are interactional metadiscourse markers, such as stance, hedges, persuasion, boosters, and engagement. Researchers explore how authors convey their ideas, present evidence, express their stance on various topics, and engage with readers. They use hedges (cautious language) to qualify claims and avoid overgeneralization. Simultaneously, they employ boosters (strong language) to emphasize key points. Persuasion is a recurring theme in academic writing, as scholars aim to investigate how metadiscourse resources are employed to convince readers of their arguments. These metadiscourse resources help authors establish their presence and create a sense of cohesion within the academic community. In addition, it is seen that the major metadiscourse model adopted is Hyland’s interpersonal model which includes the interactional vs interactive metadiscourse taxonomy.

4.3.2. Keyword Co-occurrence Network

In the VOSviewer co-occurrence network, each node, depicted by a rectangle or a circle, represents a unit of analysis. A cluster, marked in a distinct color, contains those nodes that are highly related to each other. The distance between the nodes reflects the degree of relatedness of the nodes, and the size of each node is measured by its weight which represent the number of publications or citations, or the publication year (van Eck & Waltman, 2010). With the minimum number of occurrences of a keyword set at 4, VOSviewer identifies 81 keywords. In the analysis panel, the minimum cluster size is set at 10 and small clusters are merged, with others in default settings. As a result, these keywords are automatically grouped into 6 clusters (See Figure 8).

Many co-occurrences of one keyword or pairs of keywords may indicate a research theme in the field of metadiscourse studies. The first cluster in Fig. 8 has 22 keywords. The most studied topics are the disciplinary variation of interactional metadiscourse markers (stance, engagement, and attitude) and interactive metadiscourse markers (code glosses and reformulation markers) from the perspectives of pragmatics and intercultural rhetoric. Researchers in this cluster mainly adopt two research methods (corpus analysis and contrastive analysis) to examine the role of metadiscourse markers in English and Persian academic discourse. Besides, the grammaticalization of discourse markers, the role of lexical bundles, and the translation difference of metadiscourse markers draw many researchers’ attention.

Figure 8. Visualization network of co-word analysis



Note: weights (circle sizes) measured by co-occurrences, circle colors representing different clusters.

The next green cluster includes 17 keywords. The major research topics in the cluster lie in diachronic change, textual interaction such as cohesion and coherence, appraisal resources (negation, evaluation), and authorial voice. The most studied genre is research articles, especially research articles in applied linguistics, which suggests that a growing interest in the role of metadiscourse as a rhetoric device writes employ to establish a persuasive argument to get published or make their points understood. With regard to the move structure, the discussion section is the most investigated rhetorical organization in research articles because the discussion section is where researchers employ a variety of metadiscourse markers (e.g., stance, authorial voice) to argue for the importance of their findings and convince readers that their results are meaningful (Abdi, 2002).

The third blue cluster contains 15 items. Like the red cluster, the blue cluster also focus on the interpersonal model to explore the functions of both interactional and interactive metadiscourse. The cluster employs contrastive rhetoric to deal with such research topics as evaluation, voice, writer identity, self-mention, politeness and authorial stance. However, the genres investigated are different. The blue cluster is mainly focused on professional communication and business communication. The participants examined are EFL (English as a foreign language) learners.

The following brown cluster has 14 keywords. The major research topics are mainly concentrated on hedging and boosting. Besides, the role of metadiscourse in building persuasion and knowledge building also catch many researchers' attention. The cluster also shows that the most commonly used research methods are discourse analysis and genre analysis, especially move analysis. The theoretical perspectives adopted are rhetoric (rhetorical structure) and reflexivity. And, the most investigated genres or registers lie in abstracts of research articles and political discourse. The language studied is focused on Spanish.

The last purple cluster has 13 items. It is mainly concentrated on the functions of metadiscourse markers in spoken academic discourse, such as lectures and classroom discourse. Another research strand lies in visual metadiscourse and multimodality, examining the role of visual resources in structuring the discourse, hedging their claims or engaging with readers in the multimodal or digital discourse. The major theoretical framework is Halliday's systemic functional linguistics, especially its appraisal and engagement systems, to explore meta-discursive functions of academic discourse. Besides, scholars examine interconnections among the four terms (metadiscourse, metacognition, metalanguage and metacommunication), with a focus on the reflexive dimension of language.

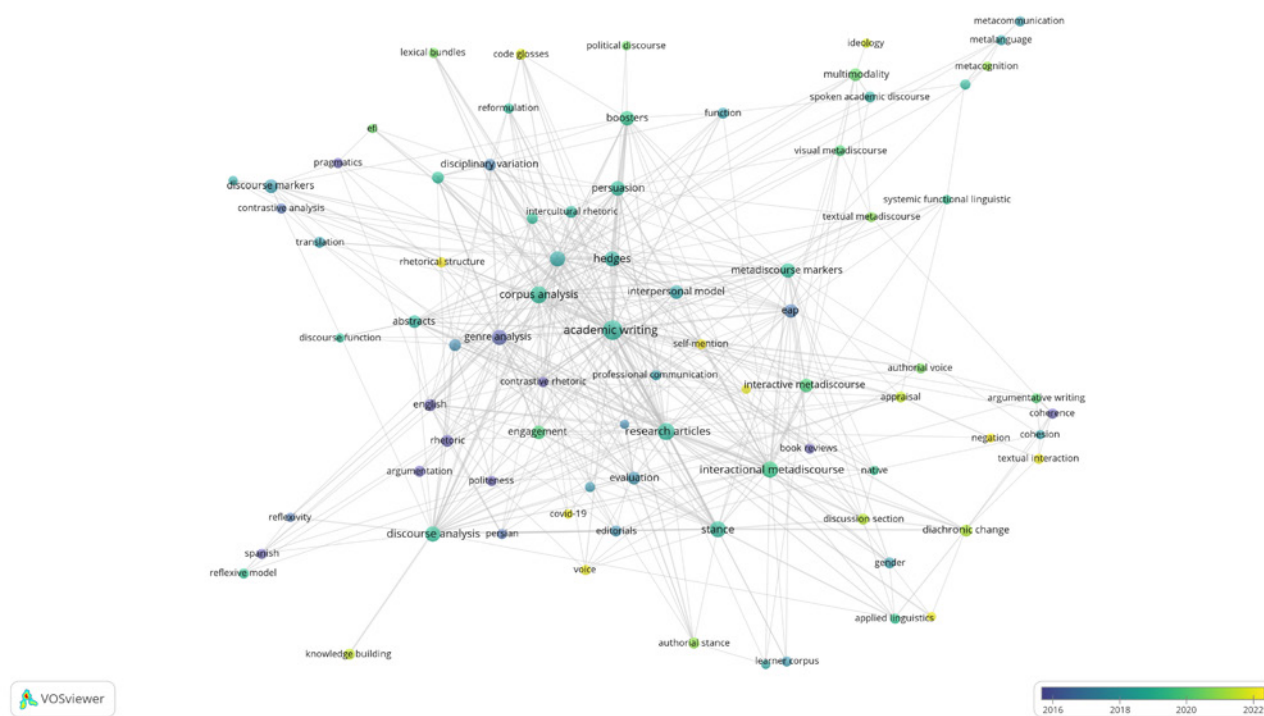
4.4. The Evolution of Research Themes

Keywords are like signposts that tell you where a field of research is going and what's important along the way. Therefore, the evolution of research themes can be identified from keywords in different years. Given that, VOSviewer's year-overlaid visualization is employed to sketch the evolution of metadiscourse research topics. Figure 9 uncovers the diachronic change of the above-mentioned 81 keywords during the 45 years.

In the early period, the study of metadiscourse mainly combines theories of rhetoric and pragmatics with the use of genre analysis and contrastive analysis to investigate disciplinary variation, argumentation,

politeness, coherence, and reflexivity in such genres as EAP (English for Academic Purposes) and book reviews. The major languages investigated are English, Persian and Spanish. Overall, metadiscourse research in the early years emphasizes its interdisciplinary approach and focuses on understanding how language choices shape meaning and communication across genres and languages.

Figure 9. overlay network of co-word (author keyword) analysis



Note: weights (circle sizes) measured by co-occurrences, circle colors representing average publication years.

Then its focus shifts to employ two major approaches (corpus analysis and discourse analysis) to probe the function of interactional metadiscourse (hedges, boosters, stance, engagement, attitude, persuasion, evaluation) and the guiding role of interactive metadiscourse (reformation and cohesion) in academic writing, research articles and editorials, based on the textual-interpersonal metadiscourse model. Besides, spoken discourse such as academic lectures and classroom discourse also draw many researchers’ attention. In a word, researchers, who employs corpus and discourse analysis methods, analyze how writers use interactional metadiscourse (hedges, boosters, etc.) to engage readers and shape their message in academic writing and lectures, with an aim to help people understand how language functions within different academic contexts.

In recent years, researchers proceed to examine authorial stance and voice, appraisal, and diachronic change in such genres as political discourse, argumentative writing, and research articles, especially in the field of applied linguistics. Another research topic in this period is multimodality, visual metadiscourse, and lexical bundles. Scholars pay also great attention to such topics as self-mention, negation, code glosses. Besides, some researchers from science education explore the role of metadiscourse in students’ knowledge building. This demonstrates that the field of metadiscourse research is expanding its focus and exploring new avenues to understand how language functions in various contexts.

In a summary, the evolution of research themes can be tracked from genres studied, research approaches used, research models adopted, and theoretical frameworks taken. The genres evolve from a focus on written texts through spoken discourse to multi-model discourse. The research methods shift from analyzing written text and broader academic discussions to using large datasets of language (corpus analysis). The research models change from a focus on cohesive devices (textual or interactive) to an emphasis on the dynamic interaction between discourse participants (interactional). The theoretical underpinnings move from comparing writing styles across languages (contrastive rhetoric) to the role of context and meaning in language (pragmatics) to a systemic view of language as a system of choices (systemic functional linguistics).

5. Conclusion

In summary, this study provides a comprehensive state-of-the-art review of 953 metadiscourse studies published between 1979 and 2023. The bibliometric analysis and social network analysis are employed to analyze the retrieved bibliometric databased with software tools bibliometrix and VOSviewer, examining the academic performance, collaboration networks, research themes and their temporal evolution. The bibliometric analysis shows that the overall trend of metadiscourse-related publications has been on the increase, with a relatively slow growth before 2005 and two periods of rapid growth after 2005 and 2015. As to the number

of publications, *Journal of English for Academic Purposes* is the most productive journal, Ken Hyland is the top prolific author, Hong Kong Polytechnic University is the top productive institution, and China is the top productive country. The social network analysis of these publications yields collaboration networks (author, institution, and country), and keyword-based co-occurrence networks. The collaboration networks show the most fruitful co-author collaboration network (Ken Hyland, Polly Tse, and Feng Jiang, and Jing Wang), and the most productive co-institution network (Hong Kong University of Science and Technology, University of London, and Chinese University of Hong Kong), and the most productive co-country network which is dominated by China with five English-speaking countries (England, Australia, Singapore, New Zealand and USA).

The keyword-based co-occurrence network sketches major research areas and detects their changing trajectory. The major metadiscourse research themes lie in research scopes (academic discourse), research approaches (discourse analysis, genre analysis, and corpus analysis), metadiscourse models (textual-interpersonal, interactive-interactional), and theoretical frameworks (rhetoric, pragmatics, systemic functional linguistics). The research trends of metadiscourse studies detects the changing trajectory of research scopes, approaches, models, modes and theoretical frameworks. It is found that more recent research is focused on the use of corpus analysis to investigate persuasion, stance, evaluation and engagement in L2 writing, and academic writing, based on the interactive-interactional metadiscourse model. It is found that recent research delves into the analysis of stance, voice, and evaluation as well as diachronic change of metadiscourse. It also explores multimodality, visual metadiscourse, lexical bundles and knowledge building in science education.

In a word, it presents a viewpoint different from traditional literature reviews in metadiscourse, offers an overall picture of metadiscourse studies, and visualizes the research themes and the evolution of research trends. Also, the analysis presented in this paper would develop a shared understanding of the ideas and influential forces that influence knowledge production within the domain of metadiscourse. Hence, it is hoped that the knowledge of where the field of metadiscourse has traversed over the years can enable researchers to be well prepared well for the emerging research trends in the future.

The study has the following limitations. On the one hand, the study is conducted only on publications indexed in the WoS Core Collection database, and future researchers are advised to employ other databases, such as Scopus, EBSCOhost, and Google Scholar, to explore the research theme evolution in the field of metadiscourse. On the other hand, the mere use of keyword co-occurrence analysis to map research themes may not reflect the whole research picture in that some journals' publications do not contain keywords (Zupic and Čater 2015). Therefore, future researches can employ the combination of citation analysis, co-citation analysis, bibliographical coupling with co-occurrence analysis to increase research rigor.

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CREDIT Authorship Contribution

Gaoxin Li (First author) Conceptualization, Data Curation, Formal Analysis, Fundraising, Research, Methodology, Resources, Software, Visualization, Writing-Original draft, Writing-Reviewing & Editing; **Jinfen Xu** (Corresponding author) Conceptualization, Management of the Project, Methodology, Resources, Supervision, Writing-Reviewing & Editing.

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