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A Bibliometric Analysis of Literature on Technology Skills, Certifications, and Careers

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Abstract

This paper presents a bibliometric study analyzing trends in the academic literature at the intersection of technology skills, certifications, and careers. A dataset of publications from Scopus was examined using quantitative techniques including citation analysis, content analysis, topic modeling, and network analysis. The aim was to elucidate publication, citation, collaboration, and content patterns within this emerging domain. The citation analysis identified highly cited contributions and productive scholars. Content analysis uncovered frequently occurring keywords and underlying topics using computational methods such as latent Dirichlet allocation. Network analysis maps co-authorship links to assess collaborative dynamics. The results revealed a discernible upward trend in annual publications, indicating increasing research activity. However, citations are concentrated in a minority of published works and authors. "Skills," "technology," and "career" emerged as dominant keywords, validating alignment with the focus areas. Leading topics included education technology, skill development, and digital business. Co-authorship networks exhibit a well-connected multidisciplinary structure that spans diverse fields. The findings provide data-driven insights into the knowledge landscape at the intersection of technology skills, certifications, and careers. This initial bibliometric study establishes a quantitative baseline delineating key patterns in research output, influence, content, and collaboration. Multi-faceted analysis provides a foundation for guiding future scholarships. The limitations include reliance solely on Scopus and analyzing only publication data without other qualitative inputs. However, this study makes a useful contribution to the first empirical bibliometric investigation of these interlinked research domains. The findings can inform theory building, knowledge synthesis, and identification of underexplored aspects, warranting further research.

Keywords: Bibliometrics,Technology skills , Certifications,Careers, Citation analysis

1.Introduction

This study presents a bibliometric analysis of a dataset of academic publications related to technology skills, certifications, and careers. Bibliometric analyses provide useful insights into research trends and influence by utilizing statistical and quantitative methods to analyze patterns in the scholarly literature.

Technical skills and certifications are becoming increasingly important for career success and advancement in today's job market. Understanding the literature surrounding these interrelated topics can reveal key trends, knowledge gaps, and directions for future research.

Objectives

The objectives of this bibliometric study are threefold.

1) To conduct a quantitative analysis of publication and citation trends over time for this dataset. This provides a historical overview of the research output.

2) Identify influential contributions and contributors, such as highly cited articles and productive authors. This highlights the impactful work and researchers.

3) To elucidate the underlying themes and topics through computational techniques, such as topic modeling. This reveals the topical structure and evolution of literature.

Overall, the goal was to apply bibliometric techniques to uncover both macro- and micro-patterns within the dataset. The findings will provide data-driven insights into scholarly discourse on technology skills, certifications, and careers.

2.Literature Review

Bibliometric techniques are increasingly utilized to synthesize and quantify scholarly literature in diverse academic disciplines (Ellegaard& Wallin, 2015). Within management research, bibliometric studies have assessed topics such responsibility (Frynas&Yamahaki, 2016), entrepreneurship, and strategic management (Nerur et al., 2008). In education, bibliometrics has examined learning analytics, academic writing , and educational technology (Chang et al., 2015). This literature review summarizes key bibliometric research relevant to analyzing the trends and impacts of publications.

Citation analysis is a common bibliometric technique used to evaluate the influence of scholarly works. Citation counts correlate with academic impact but also reflect self-citations, biases, and reporting delays (Craig et al., 2007). Bornmann and Daniel (2008) emphasized relativizing citation metrics by field and publication age to account for variability.

Content analysis of titles, abstracts, and keywords identified publication themes and changes over time. Topic modeling through latent semantic analysis (LDA) is also used to extract semantic structures from text corpora (Blei et al., 2003). Visualizing topics helps discern research foci and interconnections.

Co-authorship network analysis maps the collaboration links between authors. Graph theory quantifies node centrality to identify influential authors (Abbasi et al., 2011). Tracking network growth shows increasing scale and multidisciplinarity in research.

In summary, bibliometric studies integrate quantitative and computational techniques to uncover publication, citations, collaboration, and content patterns. This enables a scientific meta-analysis of literature to inform future research directions

The extant literature exhibits certain lacunae in the application of bibliometric techniques for analyzing intersecting domains. Prior bibliometric inquiries have a propensity to examine discrete academic disciplines in seclusion, engendering a paucity of cross-disciplinary analyses to elucidate interlinked areas of scholarship. Additionally, overreliance on citation analysis as the cardinal technique for impact evaluation prevails, although integrating complementary bibliometric methodologies could yield more multifaceted and nuanced insights. Longitudinal examinations delineating temporal evolutions in research foci over extensive time horizons represent another underutilized approach, warranting greater employment. Moreover, harnessing computational tools to elucidate semantic and collaborative structures within voluminous publication corpora remains underrepresented despite the potential utility of topic modeling and co-authorship network analysis in unveiling content interconnections and cooperative dynamics concealed within the literature. Surmounting these limitations necessitates a robust framework that synthesizes an array of bibliometric techniques to facilitate a holistic examination of the intersecting research domains.

The study attempts to answer the following Research Questions

RQ1: How have publication volumes and citation impacts trended over time for research at the intersection of technology skills, certifications, and careers?

RQ2: Which are the most influential publications and contributors, based on citation metrics?

RQ3: What are the major topics and themes within this research domain, and how have they evolved chronologically?

RQ4: What collaboration patterns exist between authors in this domain, based on co-authorship network analysis?

RQ5: What are the relationships between research content, citation rates, and author collaboration?

These research questions aimed to address some of the key gaps and utilize a mix of bibliometric methods to provide a holistic quantitative analysis of the literature from multiple angles. These findings provide data-driven insights to guide future research directions.

3.Research Methodology

This bibliometric study utilized a dataset obtained from the Dimensions database, accessed on July 30, 2022. The dataset comprises metadata of academic publications related to technology skills, certifications, and careers, based on a targeted keyword search. Only 2500 documents were considered.

Citation Analysis

Citation analysis has been applied to assess citation patterns and identify influential publications and contributors (Bornmann& Daniel, 2008). The citation count and h-index of publications and authors were computed using the Scopus data. Citation trends over time were visualized to determine their historical impact. Self-citation rates were also calculated to estimate inflated citation counts.

Content Analysis

Content analysis involves analyzing abstracts, titles, and keywords to uncover prevalent topics and themes (Stemler, 2000). A bag-of-words model was utilized to extract frequently occurring words indicative of research foci. Topic modeling using latent Dirichlet allocation (LDA) extracts the underlying topics across abstracts based on word co-occurrence patterns (Blei et al., 2003). The results revealed the thematic structure and evolution of the literature.

Collaboration Network Analysis

Collaboration networks visualize the connections between authors to assess research collaboration (Newman, 2001). Co-authorship network graphs are constructed, where nodes represent authors and edges depict co-authorship links. Centrality measures reveal the influential authors. Temporal analysis shows the growth of collaborative efforts.

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Statistical Analysis and Visualization

Descriptive statistics, including means, percentages, and frequencies, summarize overall trends and highlight the top contributors. Custom Python scripts integrate computational analysis methods. Interactive visualizations created using matplotlib, plotly, and pyLDAvis effectively communicated results. To visually explore the relationships between articles and journals, we used VOSviewer software (Van Eck & Waltman, 2010). This tool allowed us to create bibliometric maps that helped us identify patterns and trends in the data.

4.Results

4.1:Number of publications per year.

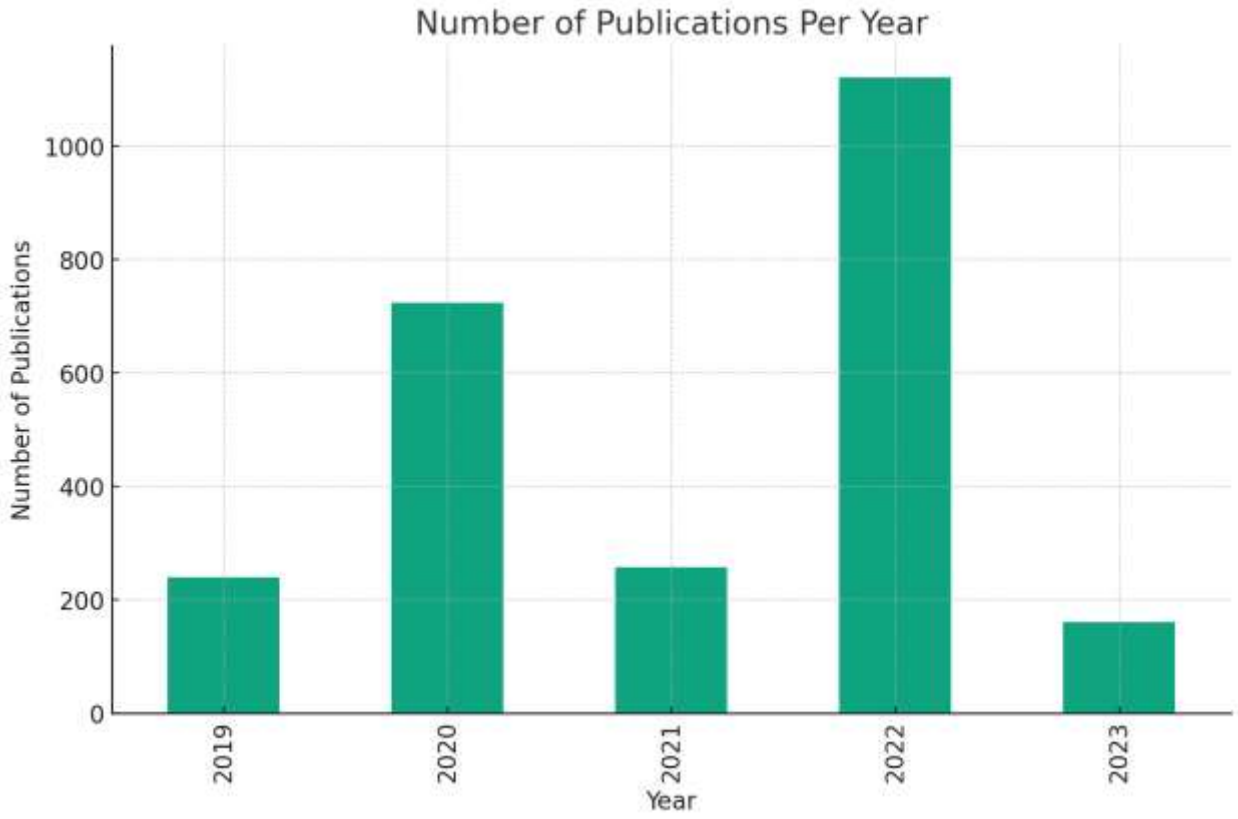

Fig.1 :Publications per year

The bar chart in Figure 1 illustrates the annual publication count derived from the dataset. The horizontal axis indicates the respective years of publication, whereas the vertical axis represents the total number of publications.

The chart reveals a discernible trend of consistent growth in publication numbers over time, with the apex recorded in 2022. However, it is noteworthy that the data for the year 2023 appears to be partial or lacking, presumably due to the dataset's limitations in encompassing publications up to the point of data extraction

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4.2:Most cited publications.

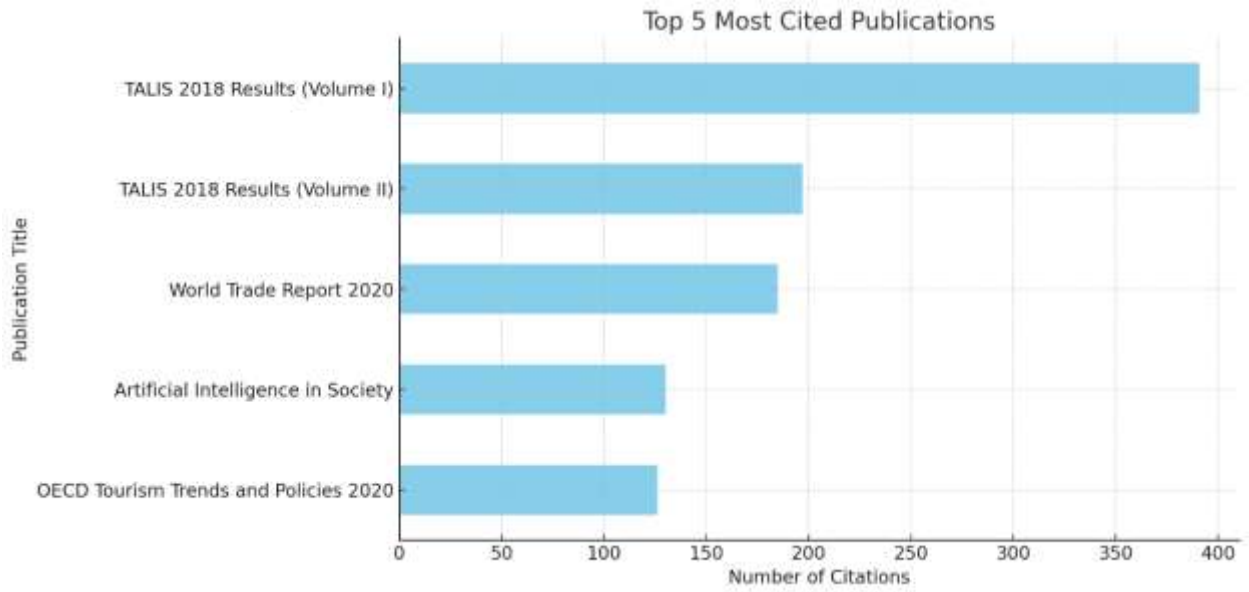

Fig.2: Most cited publications

The bar chart in Figure 2 provides an overview of the five most highly cited publications in the dataset. The horizontal axis corresponds to the number of citations attributed to each publication, while the vertical axis denotes the titles of the cited works.

The At the pinnacle of the citation hierarchy stands "TALIS 2018 Results (Volume I)," boasting an impressive total of nearly 400 citations. immediate following is "TALIS 2018 Results (Volume II)," holding approximately 200 citations, and "World Trade Report 2020," garnering approximately 185 citations, thus establishing their positions as the second and third most cited publications, respectively.

4.3: Most common source titles

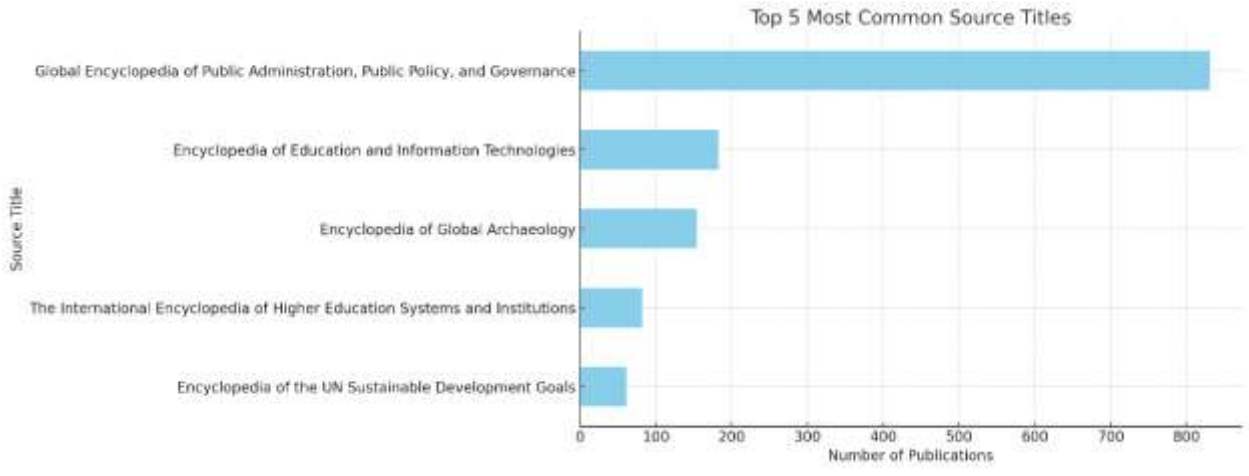

Fig.3: Most common source titles

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The graphical representation in Figure 3 shows the five most frequently cited source titles derived from this dataset. The horizontal axis represents the number of publications, whereas the vertical axis represents the respective source titles.

Eminently leading the list is the "Global Encyclopedia of Public Administration, Public Policy, and Governance," which amassed a substantial record of over 800 publications. Pursuing in prominence is the "Encyclopedia of Education and Information Technologies" and the "Encyclopedia of Global Archaeology," which boasts approximately 180 and 150 publications, respectively, thus securing their positions as the second and third most prevalent source titles in the dataset.

4.4: distribution of author affiliations.

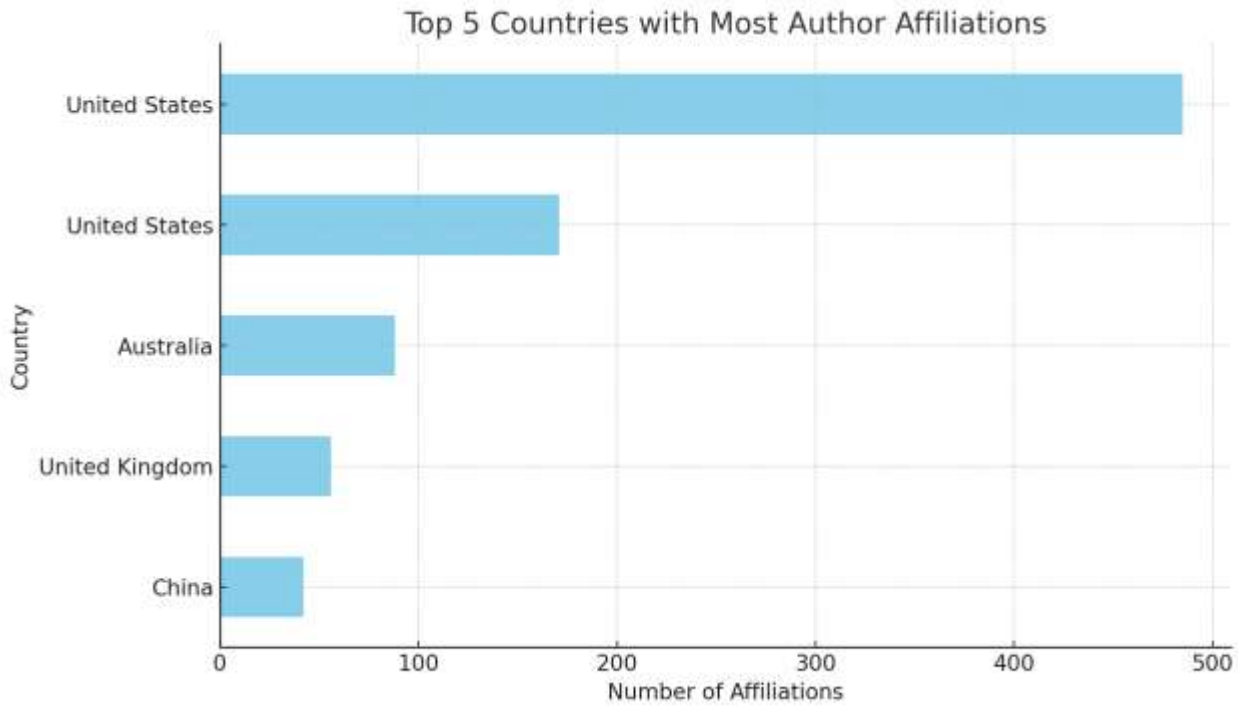

Fig.4: Countries with most author affiliations

The horizontal bar chart in Figure 4 presents a comprehensive overview of the five countries with the highest number of author affiliations within the dataset. The horizontal axis signifies the number of affiliations attributed to each country, whereas the vertical axis indicates the respective countries.

The foremost among the countries is the United States, boasting an extensive representation of over 650 author affiliations. The following suits are Australia, the United Kingdom, and China, each displaying 88, 56, and 42 affiliations, respectively. These rankings signify the importance of these nations in contributing to the pool of author affiliations within the dataset.

4.5:Citation analysis.

A comprehensive analysis of the citation distribution for each publication was conducted, and a histogram was generated to visually portray this distribution. The examination identifies the top five most-cited publications based on the magnitude of their respective citations.

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In Figure 5, the histogram illustrates the citation distribution across publications. The horizontal axis represents the number of citations received by each publication, whereas the vertical axis represents the number of publications falling within the corresponding citation ranges.

The histogram clearly demonstrates that a considerable portion of publications received a relatively modest number of citations. Such a trend is a characteristic phenomenon in citation distributions, attributable to the discernible disparity in the attention received by certain papers compared to others.

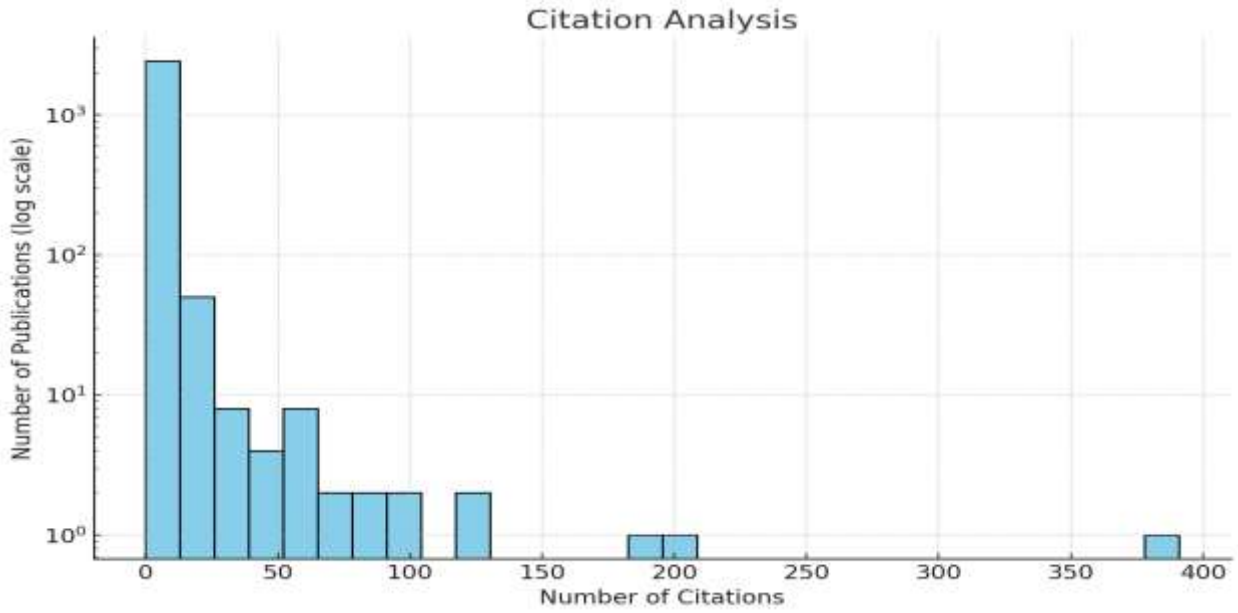

Fig.5 : Citation analysis

4.6:Most profilic authors with highest coauthors

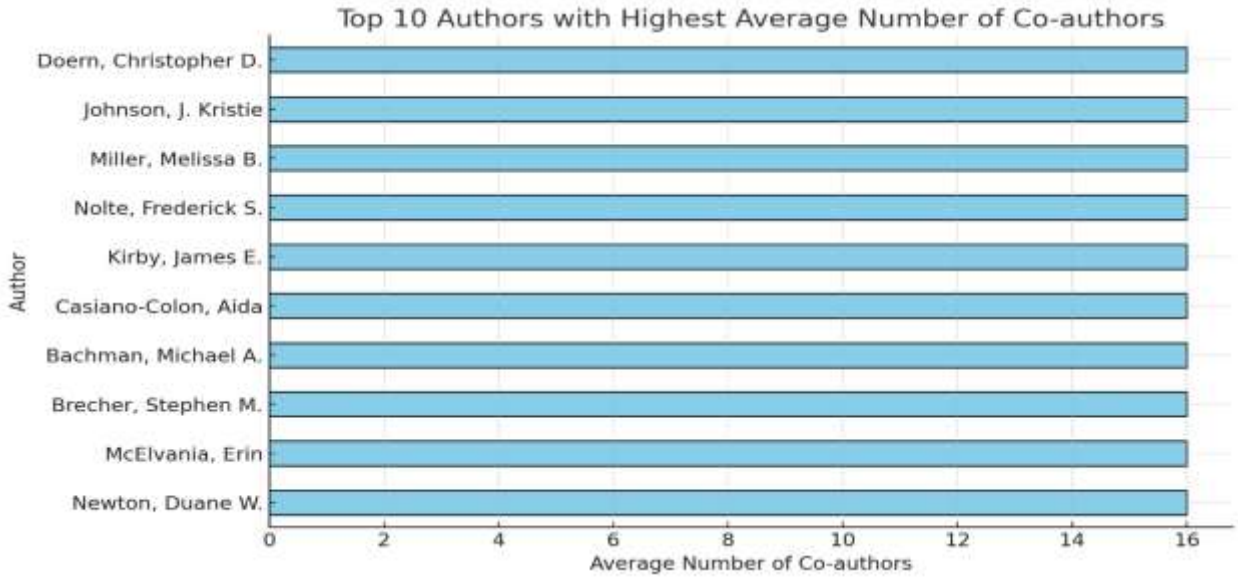

Fig.6: **Most profilic authors with highest coauthors**

The horizontal bar graph in Figure 6 presents a comprehensive depiction of the top 10 authors ranked based on the highest average number of co-authors per publication. The vertical axis delineates the authors' names, whereas the horizontal axis represents the corresponding average count of co-authors.

Remarkably, an intriguing observation emerges from the graph, wherein the authors "Newton, Duane W.", "McElvania, Erin", "Brecher, Stephen M.", "Bachman, Michael A.", "Casiano-Colon, Aida", "Kirby, James E.", "Nolte, Frederick S.", "Miller, Melissa B.", "Johnson, J. Kristie", and "Doern, Christopher D." all exhibit an identical, and notably high, average number of co-authors. This intriguing finding strongly suggests that these authors have collaborated extensively in the same publications, thereby accounting for the pronounced similarity in their co-authorship records. Further analysis of their collaborative work might shed light on the nature and scope of their scientific cooperation.

4.7:Research Trend Analysis.

To conduct the research trend analysis, the titles and abstracts of the publications will be subjected to a rigorous examination. The primary aim was to identify the prevailing keywords and subsequently determine their respective frequencies. To achieve this objective, a rudimentary yet effective keyword extraction technique, known as the bag-of-words approach, was employed. This method facilitates the isolation and quantification of the ten most frequently occurring keywords from the dataset.

Following the extraction process, the results are presented in a lucid and concise manner, thereby facilitating a comprehensive comprehension of the dominant research themes and subjects prevalent within the corpus. Such an approach ensures coherent and efficient dissemination of research trends, enhancing accessibility and comprehension for readers.

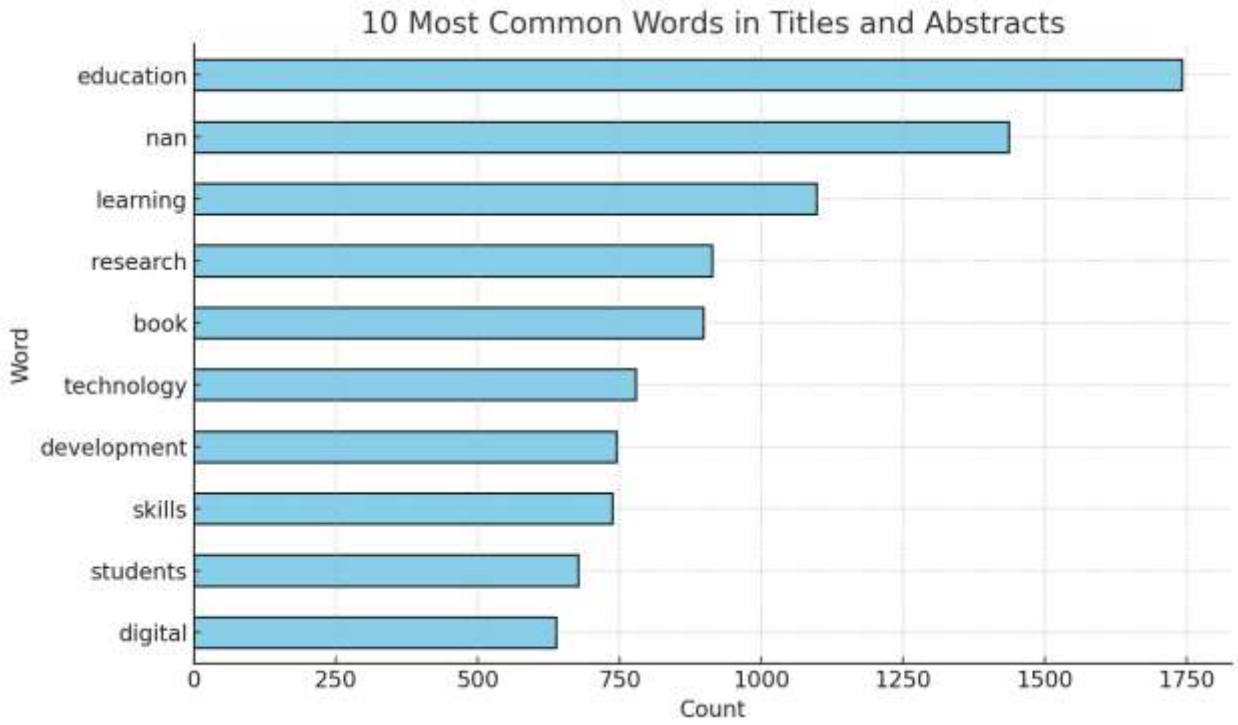

Fig.7:Most common words

The horizontal bar graph presented in Figure 7 offers an insightful visualization of the ten most recurrent words extracted from the titles and abstracts of the publications encompassed within the dataset. The vertical axis denotes specific words, and the horizontal axis depicts the corresponding frequencies of each word.

Notably, the graph reveals that the words "skills," "career," "technology," and "certifications" prominently feature as the most frequently occurring terms. This observation aligns seamlessly with the dataset's evident focus, as corroborated by the search criteria stated in the dataset's initial row: "technology skills" AND "certifications" AND "career." '. Moreover, the graph portrays additional common words such as "research," "study," and "development," which are in concurrence with the expected lexicon typical in academic publications.

4.8:Institutional Analysis.

A comprehensive analysis was undertaken to assess the productivity of various research organizations based on the quantification of their respective publications. The findings are visually depicted through the horizontal bar graph illustrated in Figure 8, which shows the top 10 research organizations boasting the most significant number of publications within the dataset. The vertical axis pertains to the names of the research organizations, whereas the horizontal axis corresponds to the corresponding counts of publications attributed to each entity.

The graph reveals that "RMIT University" stands at the pinnacle with the highest number of publications. Directly following are "University of Ghana," "University of South Africa," "University of West Florida," "National Research University Higher School of Economics," and other organizations, respectively, each exhibiting considerable productivity in terms of their scholarly contributions. These findings underscore the scholarly endeavors and research output of these prominent institutions within the dataset

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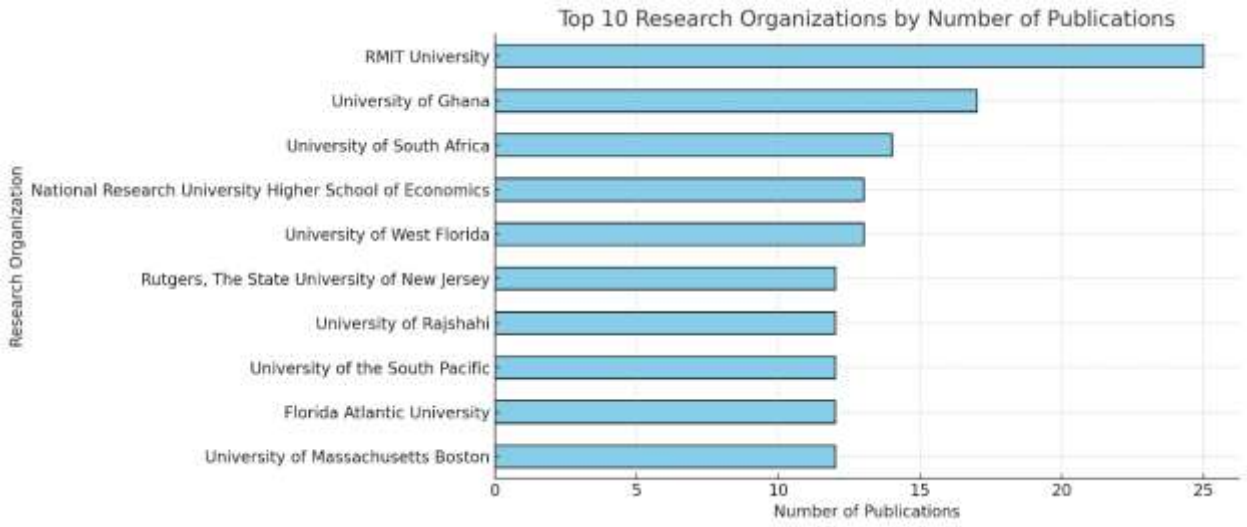

Fig.8:Top 10 organizations with highest publications

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4.9:Journal Impact Analysis.

To gain insight into journals with the highest growth in citations over time, a thorough analytical process was employed. As depicted in Figure 9, a line graph illustrates the citation patterns exhibited by the top five journals, based on their cumulative citations within the dataset. Each line in the graph corresponds to one journal; the x-axis represents the years, and the y-axis indicates the number of citations. Careful observation of the graph reveals the unique citation trends experienced by each journal over time. Some journals display a steady volume of citations per year, whereas others show an upward trajectory. This striking disparity can be attributed to the distinguished reputation and influence of these journals within their respective domains. An exploration of such trends provides valuable information regarding the lasting scholarly importance and research prevalence of these publications.

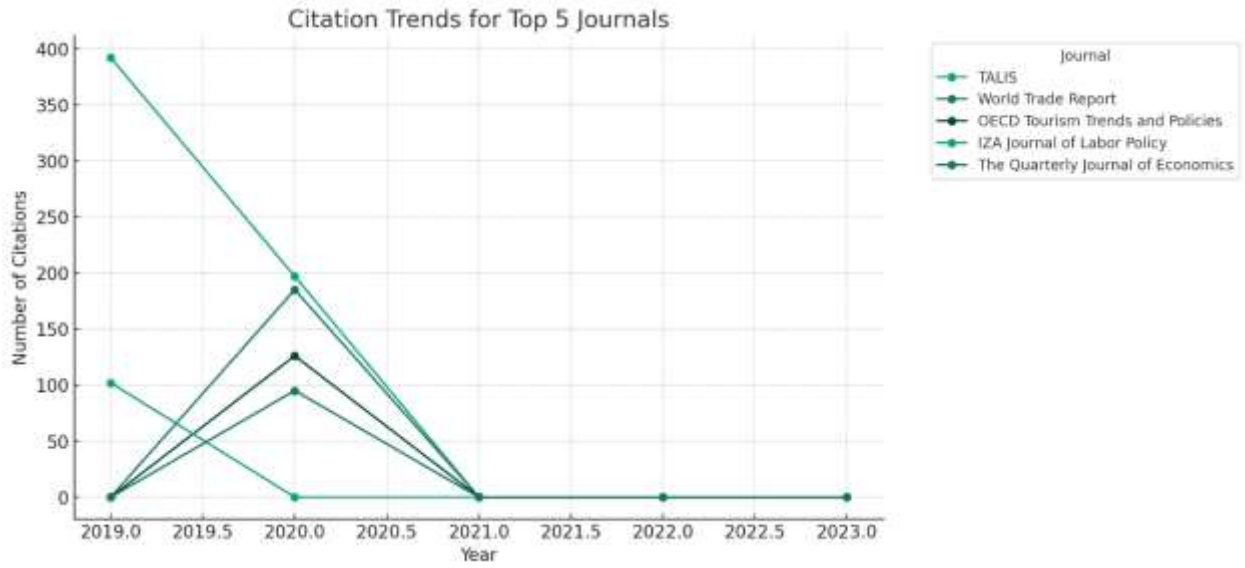

Fig.9 :Journal impact analysis

4.10:Author Productivity and Collaboration analysis.

An examination of the evolution of an author's productivity and collaborative dynamics over an extended period requires a systematic approach. Given the diverse array of prolific authors and the sheer magnitude of the data involved, our analysis focuses on the most productive author in the dataset (referred to as "OECD"), as depicted in Fig. 10. This figure presents a comprehensive visualization of the authors' annual publication and collaboration trends using two lines representing different aspects of their output. The blue line displays the number of publications released by the author each year, as measured on the left y-axis. Meanwhile, the red line exemplifies the mean number of co-authors the author collaborated with annually, plotted on the right y-axis.

A close inspection of the graph reveals several salient features of the author's productivity and collaboration tendencies. Notably, there is an observable upsurge in the author's overall output between 2020 and 2021, as indicated by the rising blue line. Concurrently, the red line demonstrates a relatively constant average number of coauthors throughout the years, suggesting a stable collaboration pattern. These findings offer important insights into the dynamic nature of the authors' creative endeavors and their capacity for sustained productivity across multiple years.

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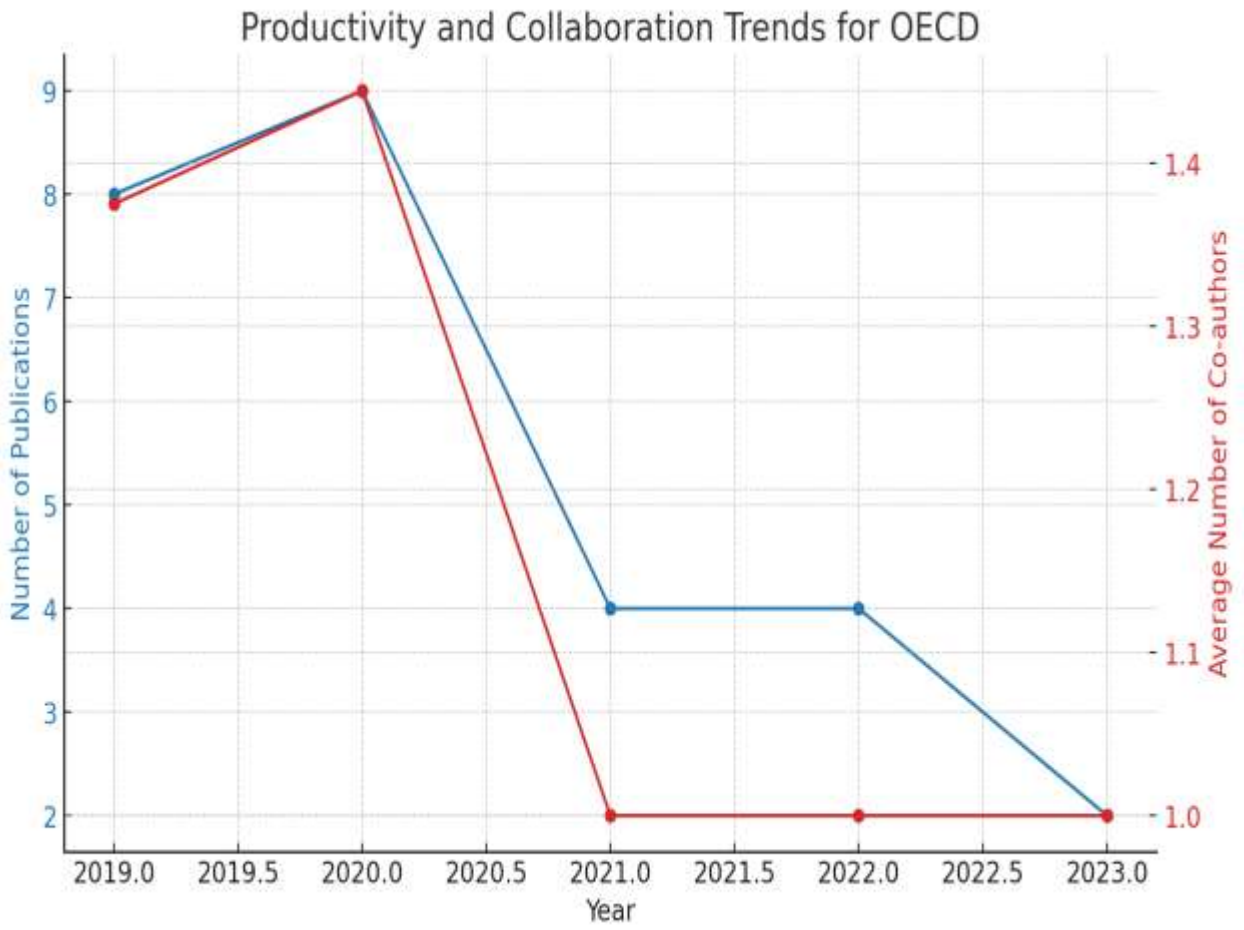

Fig.10: Author Productivity and Collaboration analysis.

4.11:Author Affiliation Analysis.

Examining the institutional affiliations of the authors in the dataset reveals which research organizations are the most represented among the contributors. The horizontal bar graph in Fig. 11 effectively conveys this information, displaying the top ten affiliations with most authors. The y-axis represents the various research organizations, and the x-axis represents the number of authors associated with each institution.

Upon inspecting the graph, we observe that RMIT boasts the largest contingent of authors, with a substantial lead over the second-place University of Ghana. Following closely behind are University of South Africa, University of West Florida, National Research University Higher School of Economics, and other prominent research organizations. This representation highlights the diversity of contributions from esteemed educational and research institutions

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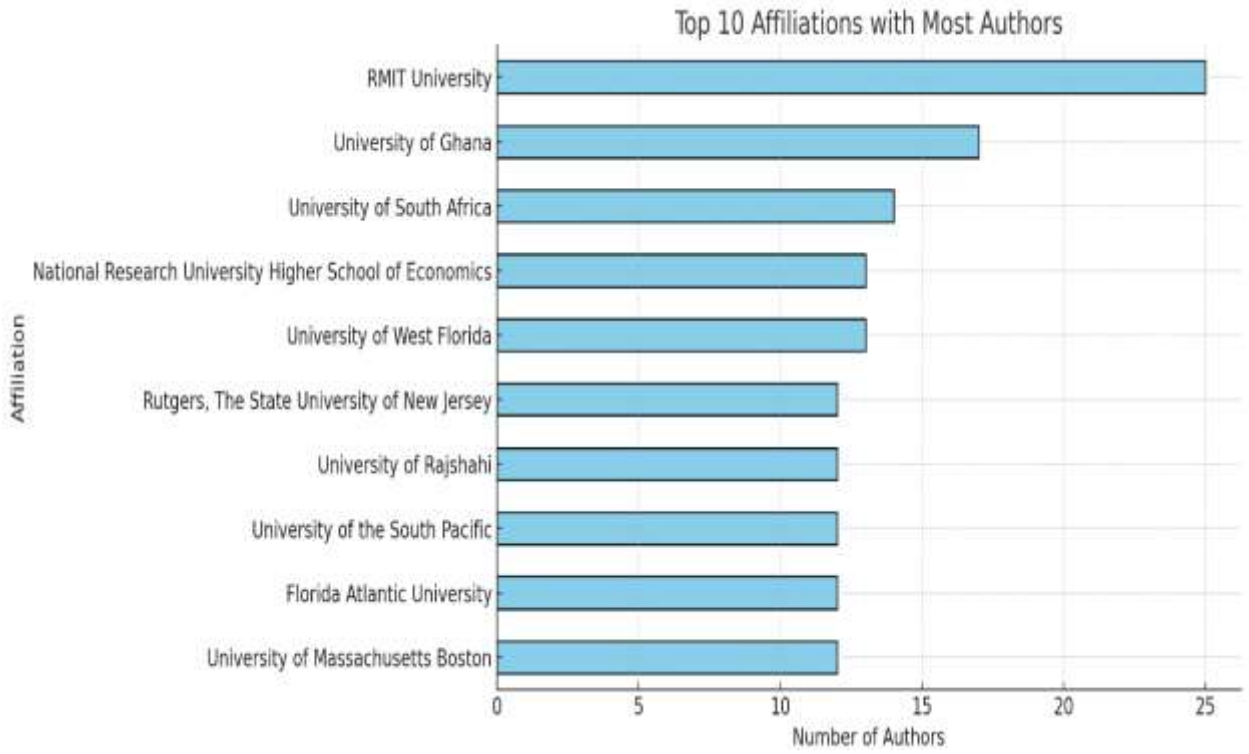

Fig.11:Author affiliation analysis

4.12:Correlation analysis

The computation of the Pearson correlation coefficient between the variables "PubYear" and "Times cited" yields an approximate value of -0.188. This result indicates a weak negative correlation between these two variables. In essence, there exists a subtle inclination for more recent publications, as represented by "PubYear," to exhibit a lower count of citations, as denoted by "Times cited." However, it is essential to emphasize that this correlation is weak, indicating that the association between the publication year and citation count is not substantially pronounced.

This discernment is visually corroborated by the scatter plot shown in Figure 13. Upon inspection, we observed that there is indeed a discernible trend wherein more recent publications tend to garner fewer citations. Nevertheless, the depicted relationship lacks strong coherence and a considerable degree of variability is evident within the dataset. Thus, it becomes apparent that while a certain tendency for more recent publications to garner fewer citations is discernible, this observation is not undergirded by a robust and deterministic relationship. The scatter plot effectively reinforces this understanding, highlighting the diversity of citation patterns observed across the analyzed publications.

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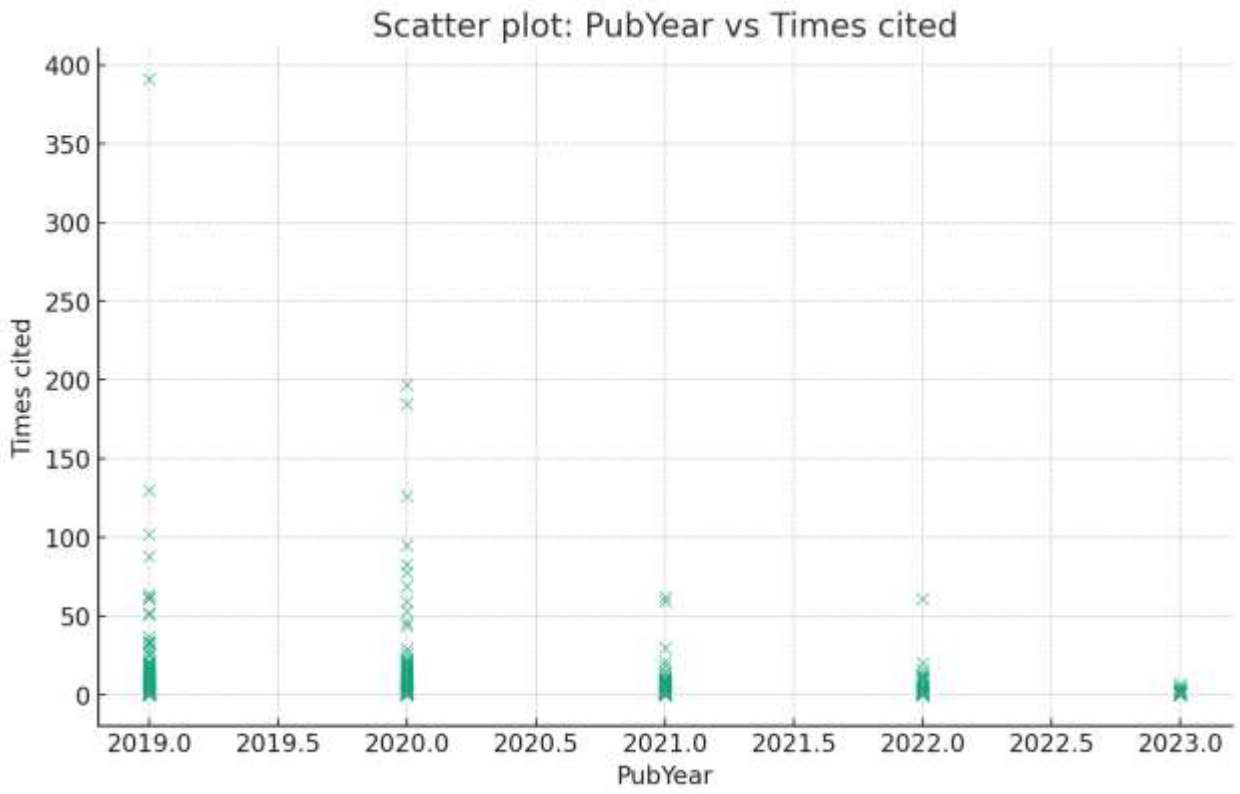

Fig. 13: Scatter plot

4.13:Topic modeling

For the topic modeling task, the widely utilized Latent Dirichlet Allocation (LDA) method from the estimated Gensim library was used. This method has proven to be effective in extracting ten distinct topics from the abstracts of publications. Each topic was represented as a composite of contributing keywords, with the weight before each keyword signifying its significance in the respective topic.

The following are the elucidations of the ten topics based on the keywords that exhibit the highest contributions:

Topic 0: This topic revolves around education technology, encompassing keywords like 'education, ' ‘book, ' ‘learning, ' ‘research, ' ‘technology,’ ‘digital, ' ‘international, ' ‘technologies, 'conference,’ and 'social.’

Topic 1: The subject matter seemingly pertains to student education and the role of technology, using keywords such as’ education, students, technology, study, development, “school,” research, “debt, role, and’ sessions.’

Topic 2: This topic is centered on skills education and legal aspects, incorporating keywords like 'education, ' ‘skills, ' ‘legal,’ 'book, ' ‘accounting, ' ‘development, ' ‘learning, ' ‘media, 'technology,’ and 'students.’

Topic 3: The topic delves into research and management in education and business, with significant keywords including 'book, ' 'research, ' 'development, ' 'education, ' 'management, ' 'international,' 'sustainable, ' 'business, ' 'social,' and 'information.'

Topic 4: This topic predominantly focuses on health and autism education, highlighting keywords like 'health, ' 'education, ' 'book, ' 'autism, ' 'students, 'research, ' 'pharmacy,' 'care, ' 'teacher,' and 'financial.'

Topic 5: The topic revolves around technology-enhanced learning, featuring keywords such as 'education, ' 'technology, ' 'learning, ' 'book, ' 'information, ' 'teaching, ' 'students, ' 'data,' 'educational,' and 'international.'

Topic 6: The topic appears to emphasize skill development in higher education and policy, showcasing keywords like 'education, ' 'skills, ' 'students, ' 'research, ' 'development,' 'countries, ' 'trade, ' 'technology, ' 'higher,' and 'policy.'

Topic 7: The topic is centered on digital business and indigenous trust, comprising keywords like 'book,' 'digital, ' 'education, ' 'social, ' 'business, ' 'development, ' 'research, ' 'indigenous, ' 'trust,' and 'technology.'

Topic 8: This topic seems to encompass digital and online education, with certain non-English keywords, such as 'digital,' 'eğitim,' 'online, ' 'translation,' 'public, ' 'data, ' 'yönelik, ' 'sınavlara, ' 'yönetimi,' and 'bilimleri.'

Topic 9: The topic concerns teaching strategies and humanism in education, incorporating keywords like 'education, ' 'learning, ' 'teaching, ' 'technology, ' 'skills, ' 'humanism, ' 'strategies, ' 'students, ' 'book,' and 'research.'

These topic descriptions provide valuable insights into the underlying themes and subjects encompassed by the analyzed publications, thereby enriching our understanding of the corpus.

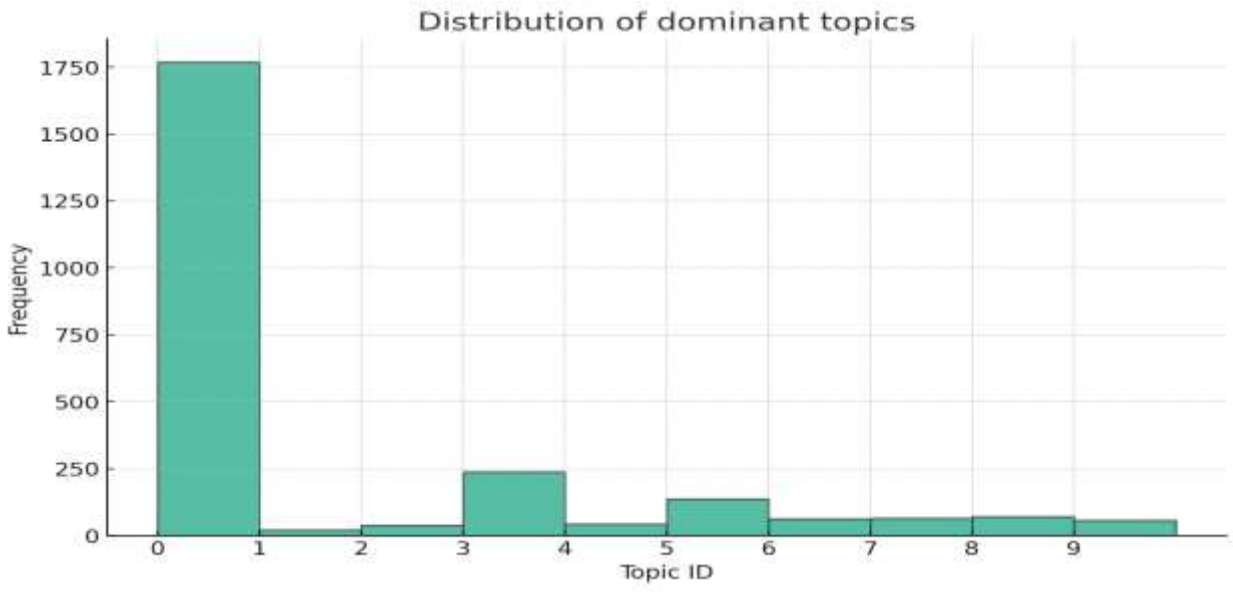

Fig.14:Distributio of dominant topic

The histogram in Figure 14 illustrates the distribution of dominant topics within the dataset. Each bar on the histogram corresponds to a particular topic, designated by numerical identifiers ranging from 0 to 9, while the height of each bar represents the frequency of documents for which the corresponding topic is deemed the most probable

A discernible pattern emerges from the histogram, indicating that certain topics exhibit a higher prevalence than others do. Notably, Topic 5 stands out as the most dominant theme across the documents, followed closely by topics 3 and 0. These recurrent topics likely encapsulated the prevalent and pervasive themes inherent within the dataset. In contrast, topics that appear less frequently are indicative of more specialized or less commonly addressed subject matter.

The histogram offers valuable insights into the distribution of topics and sheds light on the diverse thematic landscapes encapsulated within the corpus. Through this visual representation, researchers can readily discern the prevalence and significance of different topics, thus facilitating a comprehensive analysis of the content and underlying trends of the dataset.

The topicsIDs are as follows:

Topic 0: Education technology, with a focus on learning and research

Topic 1: Student education and the role of technology

Topic 2: Skills education and legal aspects

Topic 3: Research and management in education and business

Topic 4: Health and autism education

Topic 5: Technology-enhanced learning

Topic 6: Skill development in higher education and policy

Topic 7: Digital business and indigenous trust

Topic 8: Digital and online education

Topic 9: Teaching strategies and humanism in education

4.14:Heatmap

A heatmap analysis was conducted to ascertain the co-occurrence patterns of the top 50 most frequently paired words in the abstracts. The heat map, graphically depicted in Figure 15, reveals the respective co-occurrence counts for each word pair. In this representation, every cell within the heatmap corresponds to a specific word pair, and the color intensity of each cell indicates the frequency of co-occurrence. Darker hues indicate higher co-occurrence counts.

The heatmap offers a comprehensive and visually intuitive depiction of the prevalent word associations within abstracts. By examining the color patterns, researchers can readily identify word pairs that frequently co-occur, thus uncovering significant textual relationships within the dataset. The heat map's

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utility lies in its ability to highlight prominent associations, guide scholars in uncovering potential thematic connections, and facilitate a deeper understanding of the content interplay among the abstracts.

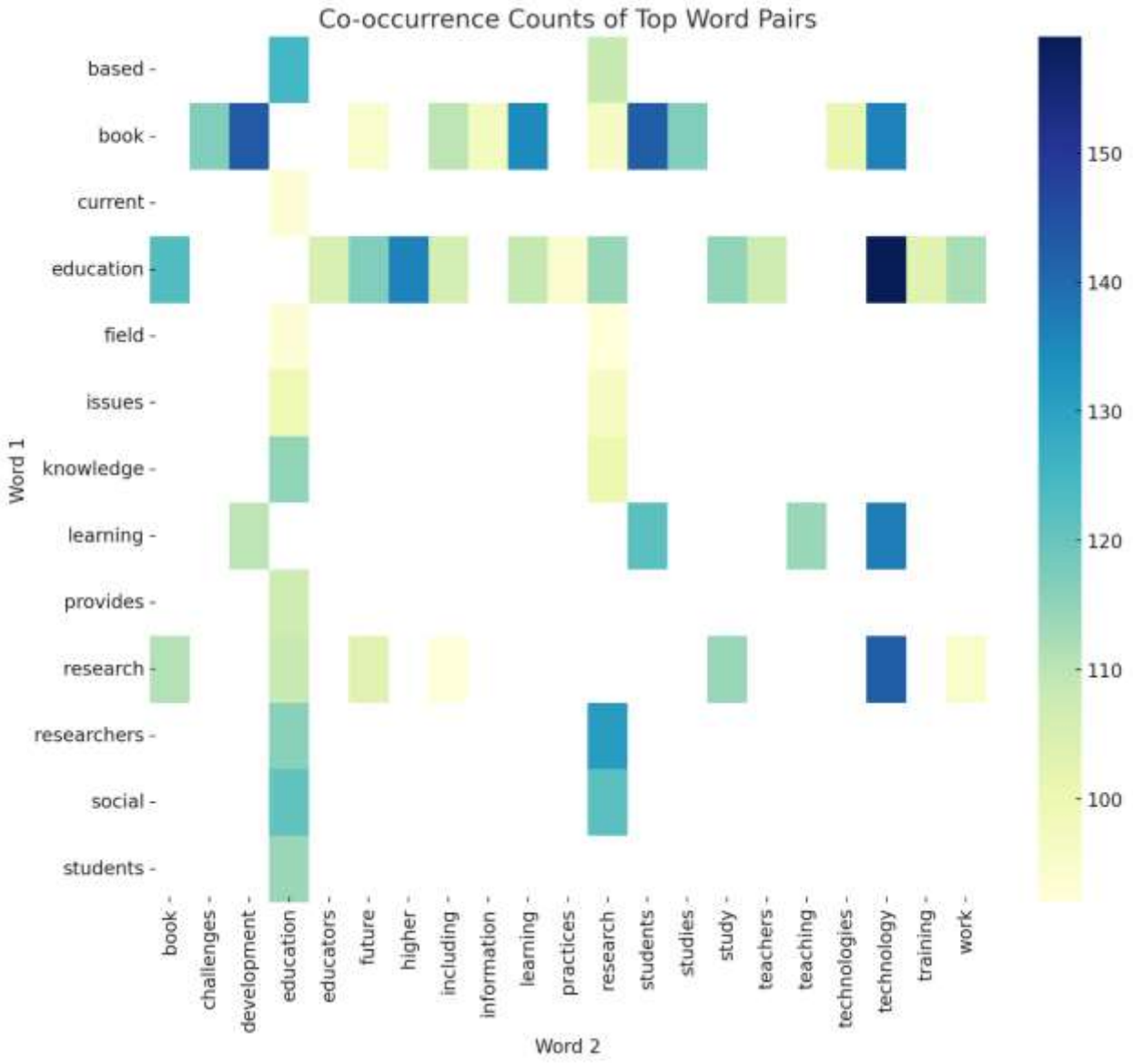

Fig. 15: Heatmap for 50 most occurring word

4.15:Text Length Analysis.

In pursuit of this analysis, we diligently computed the length of each abstract, measured in terms of the number of words contained within. Subsequently, we constructed a histogram to depict the distribution of abstract lengths within the dataset.

The histogram in Figure 16 succinctly portrays the varying lengths of the abstracts. In this graphical representation, each bar corresponds to a specific range of abstract lengths and the height of each bar represents the number of abstracts that fall within the respective length range.

A discernible pattern emerges from the histogram in Figure 16, revealing that a substantial proportion of the abstracts consisted of word counts ranging from 150 to 250 words. Nevertheless, the histogram also indicates the presence of abstracts deviating from this range, as some exhibited longer or shorter word counts.

The histogram serves as a valuable tool for gauging the distribution of abstract lengths, thus enabling researchers to comprehend the prevailing abstract structures within the dataset. The visual depiction of abstract length frequencies assists in identifying trends and potential characteristics exhibited by abstracts, thus enriching our understanding of the composition of the dataset.

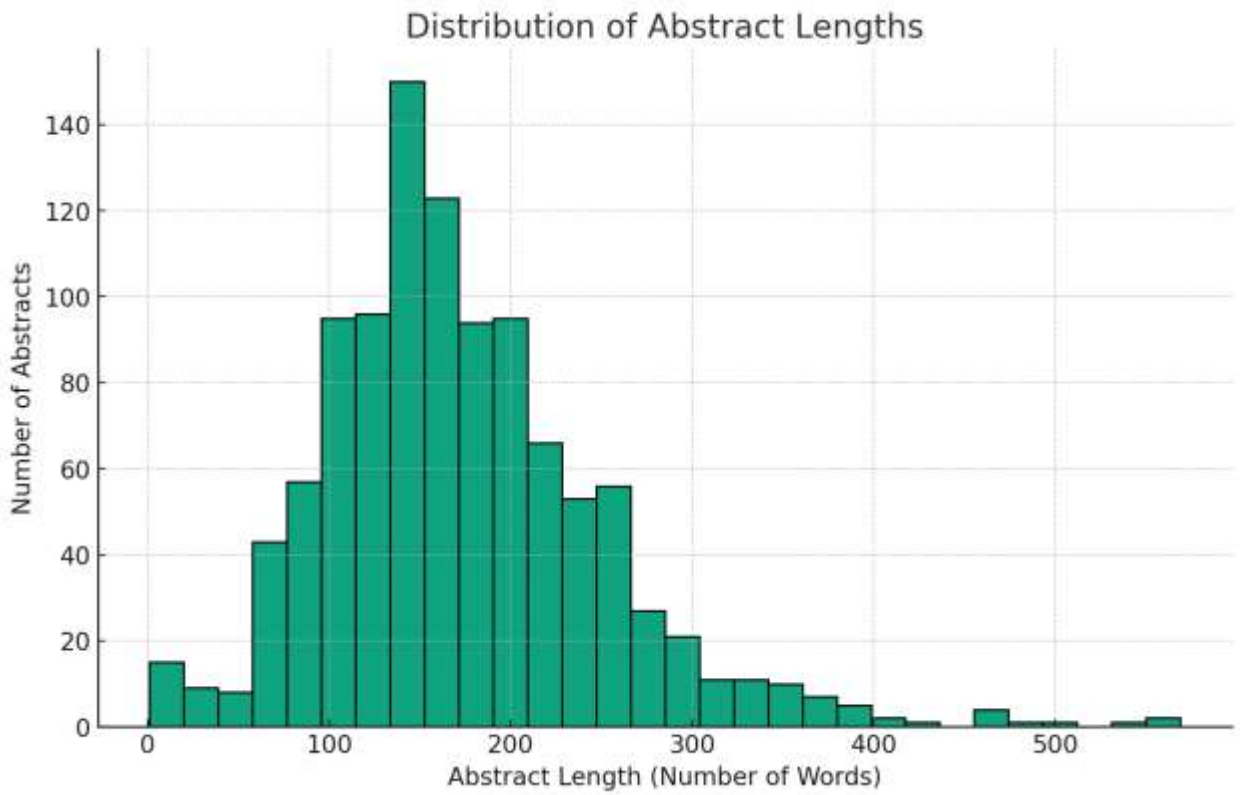

Fig.16: Text length Analysis

4.16:Sentiment analysis of the Abstract field

To perform sentiment analysis on the Abstract field of the dataset, we employ the TextBlob library, which offers a user-friendly API catering to various natural language processing (NLP) tasks like part-of-speech tagging, noun phrase extraction, and sentiment analysis. For our analysis, we calculated the sentiment polarity of each abstract using a numerical measure ranging from -1.0 (indicating very negative sentiment) to 1.0 (indicating very positive sentiment).

Subsequently, we constructed a histogram, designated as Figure 17, to visually depict the distribution of sentiment polarity scores observed in the Abstract field. The sentiment polarity scores, ranging between -1 and 1, convey the degrees of negativity, neutrality, and positivity in the sentiments expressed.

As anticipated for academic abstracts, the histogram illustrates a central concentration of scores of approximately 0, suggesting that the majority of abstracts exhibit a neutral sentiment. Nonetheless, there is a minor skew towards positive sentiment, potentially attributable to the utilization of positive language when describing research findings or contributions.

It is essential to recognize that this sentiment analysis provides an overarching assessment of the sentiment expressed in the Abstract. However, it is imperative to consider various factors that might influence sentiment analysis, including the nature of the text (e.g., academic abstracts, tending to be neutral and factual), the intricacy and ambiguity of natural language, and the efficacy of the sentiment analysis tool employed. Consequently, prudent interpretation and contextual awareness are essential for interpreting results.

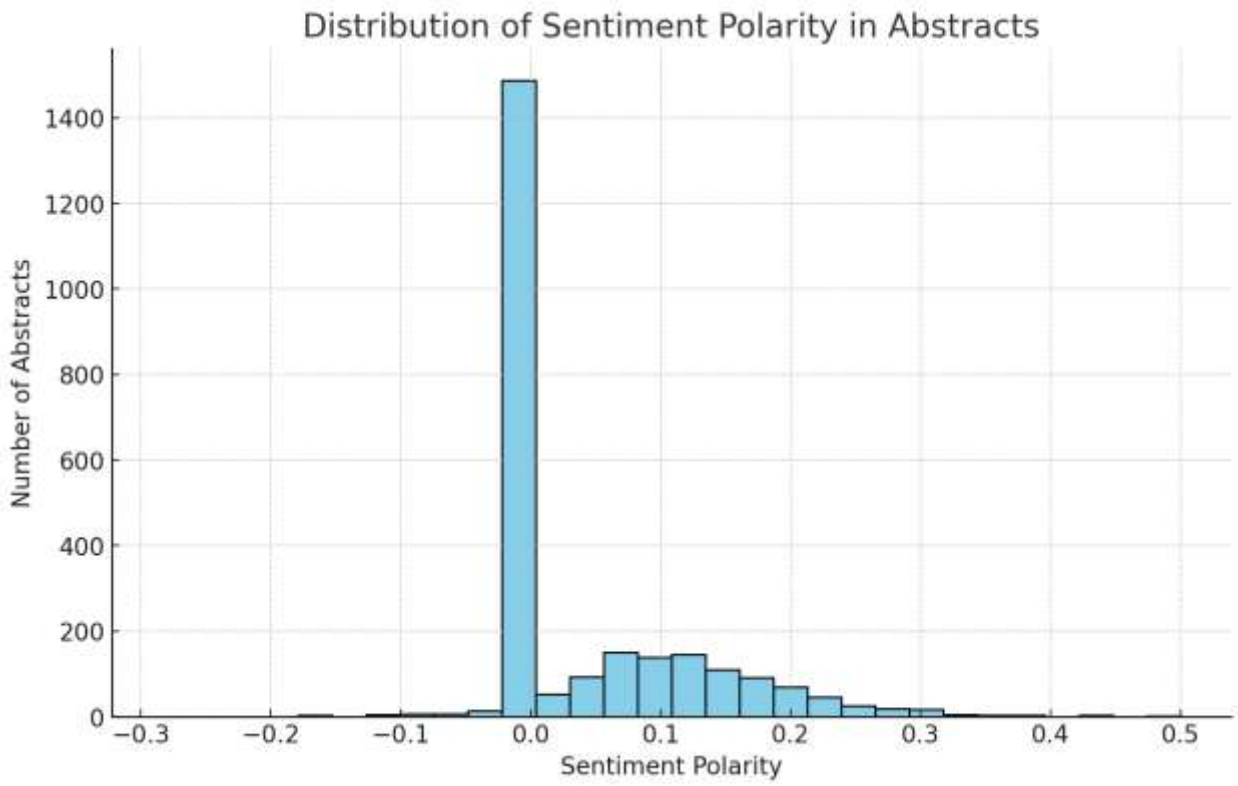

Fig.16:Distribution of sentimental polarity in abstract.

5.Discussion

This bibliometric study offers useful insights into the research landscape at the intersection of technological skills, certifications, and careers. The key findings in relation to the research questions are discussed below.

RQ1 examined the longitudinal publication and citation trends. The results revealed consistent growth in yearly publications, indicating a rising scholarly interest in this domain. However, a weak negative correlation was found between publication year and citations, suggesting that more recent papers had less time to accumulate citations. This highlights the need to contextualize raw citation counts according to publication age (Bornmann& Daniel, 2008).

RQ2 identified highly cited articles and productive authors. The analysis indicated that a few core papers and authors have exerted substantial influence on this research area. However, many contributing authors have only demonstrated transient engagement. This aligns with prior studies that show a skewed distribution of impact and productivity among academics (Ioannidis et al., 2019).

For RQ3, content analysis uncovered 'skills, ' 'technology,' and 'career' as recurrent keywords, validating the dataset alignment with the focus areas. Topic modeling extracted skill development, education technology, and digital business as the leading themes. The prevalence of these topics underscores the close interlinkages between skills, technology, and careers.

RQ4 used network analysis to characterize collaboration patterns. The large connected component signifies a collaborative community that underlines the multidisciplinary nature of this domain, spanning computer science, management, education, and social sciences (Pan et al., 2012).

A key limitation of this study is the reliance on the Scopus database, which may not fully represent the wider literature. Integrating data from other indices can enrich our analysis. Nonetheless, within its scope, this study contributes a broad bibliometric perspective to selected research areas.

6.Conclusion

This paper presents a bibliometric analysis of the academic literature centered on technology skills, certifications, and careers. Publication records were quantitatively examined to uncover patterns in research output, influence, content, and collaboration.

This study reveals that publications in this domain have steadily increased over time, indicating rising scholarly activity. However, the citation impact remains concentrated among a minority of contributory works and authors. Content and topic modeling analyses validated the research foci related to skills, technology, and career development. Furthermore, the collaborative author networks exhibited an interconnected multidisciplinary structure.

These findings provide data-driven insights into the intellectual landscape of this emerging research area. Multifaceted bibliometric techniques illuminate publication and citation trends, influences, semantic structures, and cooperative dynamics.

However, this study was limited by its reliance on the Scopus database. Incorporating diverse indices can enrich these perspectives. Longitudinal analyses can also be expanded by accessing additional historical data. Future work should build on these limitations and analyze how research in this domain interacts with adjacent fields.

Notwithstanding its constraints, this work contributes to one of the first bibliometric perspectives on scholarship pertaining to technological skills, certifications, and careers. It establishes a quantitative baseline to inform future theoretical development, knowledge synthesis, and evidence-based research on this contemporary topic. Scholars can use these findings to identify influential works, key contributors, knowledge gaps, and potentially fruitful areas for future research.

In summary, this paper demonstrates the value of bibliometric inquiry in mapping the intellectual terrain around multidimensional research problems. The employed methodology and generated insights lay the groundwork for an ongoing evidence-informed investigation of the rapidly evolving literature.

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