

Exploring topics of the female librarians: topic modelling approach on research articles

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Abstract

Background of the study: Female librarians often face limitations in their professional development and encounter various challenges. Previous studies have shown that while many articles focus on women librarians as a subject, few delve into the topics discussed.

Purpose: This research aims to find out which topics are developing in the world of libraries, with a specific focus on female librarians.

Method: This study uses topic modelling to explore abstracts from documents discussing female librarians, using BERTopic, scattertext, and VOSviewer to identify emerging topics from data obtained from Scopus.

Findings: A total of 6 topics were determined, where Topic 0 and Topic 3 had the highest similarity. At the same time, keyword analysis did not reveal any particularly prominent keywords in the 2020s.

Conclusion: The discussion on female librarians covers topics such as professional advancement, work-life balance, knowledge gaps in technology, stereotypes, and the correlation between these topics. This study provides an overview of text analysis that librarians can use to identify topics in a collection of texts, such as abstracts, and examine how different topics relate to each other, as a single document can reflect multiple topics.

Keywords: *female librarians, gender, job satisfaction, women in librarianship, topic modelling*

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Introduction

Throughout history, women have been limited to employment opportunities in fields deemed suitable for their gender, including roles such as being a librarian. [Rubin \(2016\)](#) offers a few theories from a historical perspective about the predominance of women in American librarianship, particularly public librarianship, which may have contributed to the perception of passivity among librarians, as passivity was a cultural expectation for women well into the 20th century. As public libraries expanded in the 19th century, there was a growing demand for library workers. However, due to poor funding, libraries relied on staff members willing to work for low pay, and male library directors preferred hiring talented women for half the pay. Librarianship was seen as fitting the values of work for women at the time, which included personal improvement and the belief that books and reading could improve morals, akin to missionary work. These historical forces have left a lasting impact on librarianship, which continues to attract individuals who share these convictions, indicating that its service aspect is still deeply ingrained.

Not only does the majority of the librarian workforce comprise females, but they also dominate academic research in librarianship, indicating that this profession continues to be predominantly female. [Galbraith et al. \(2019\)](#) stated, which drew upon data from the Association of Research Libraries (ARL) that the gender wage gap in academic libraries is showing signs of improvement. The study found that the adjusted pay gap between men and women in ARL Libraries was relatively modest and considerably smaller compared to other professions in the US. The research highlights that academic libraries have taken measures to tackle gender pay inequality. Nevertheless, there are still discrepancies in salaries between males and females across all tiers of research libraries despite the aforementioned discoveries ([Howard, Habashi, & Reed, 2020](#)).

Even today, women encounter numerous obstacles, particularly in leadership positions dominated by men. The societal stereotype of librarianship being a feminine profession has created a situation where men are discouraged from pursuing them, leading to a low representation of men in these fields. This stereotype has resulted in a vicious cycle where the underrepresentation of men further reinforces the perception that these fields are exclusively for women. Men interested in these professions may be deterred due to perceived gender expectations. As a result, the gender gap in these fields persists ([Blackburn, 2015](#)).

Literature Review

Female Librarian

The occupation of the librarian has historically been more closely linked with women, specifically. From historical data gained related to gender equality in libraries, according to [Silva & Galbraith \(2018\)](#), women have been identified as the most dominant gender in library works. Men only made up 17% of the overall proportion in academic libraries, while the rest were made up of women, as was reported in their article. It was mentioned that there is also a stereotype that women's jobs are lower-paying jobs than men's. This demonstrates the unfair perception that exists in works for women.

Another issue highlighted is the lack of women in the top positions in the library profession, as was documented by several previous studies; for example, [Blackburn \(2015\)](#) denoted females as a subject related to works that are seen as feminine and earn less than males, despite the fact that they make up the majority of the gender in librarianship. Other issues stated in the prior studies was that female librarians have typically been depicted negatively, often portrayed as timid, socially awkward individuals who prefer reading books to engaging in real-life experiences.

The study by [Rutledge \(2020\)](#) found that managing work responsibilities while caring

for family and children was the most frequently mentioned barrier for women. Many participants explained that their partner's job took priority over their own or that they had to leave their jobs when their partners could not get positions. Caring for children while managing or pursuing management positions was also a common challenge, as women reported feeling guilty when they focused on work and experienced difficulty balancing careers and parenting. Although women were the majority in libraries, they were often overlooked as potential leaders or heads of libraries due to the stereotype that they were delicate and incapable of handling the demands of administrative roles.

Furthermore, another discussion regarding female gender for library professionals was surrounding areas of inclusivity and self-development. [Mars \(2018\)](#) found that the composition of the library profession today is a product of historical factors and stereotypes associated with librarians. Despite some progress, the majority of librarians are still women and they face persistent economic inequality and are underrepresented in leadership positions. As previously stated, women predominate among genders in the library world. Still, some research revealed that women must evolve if they are willing to receive the same respect and get more support and appreciation to bloom in library works.

Female in Library Positioning

Previous studies have conducted several initiatives to equalise the representation of women and men in libraries. More investigations also concentrate on the diversity phenomenon in the library; for example, to reflect society as a whole and promote more equity in the workplace, it is crucial to examine the ratio of female to male librarians ([Morales, Knowles, & Bourg, 2014](#); [Silva & Galbraith, 2018](#)). Another study investigated the barriers to female gender being in the lead of library professionals; often, that study stated cultural context to be involved as a factor, along with the biases in terms of female gender ([Lombard, 2018](#)).

On these grounds, the need to see how women play a role in Library and Information Science (LIS) leadership can be seen as many studies have discussed this issue. As ([Neigel, 2015](#)) examined in her study of gender in LIS leadership, women's involvement in leadership is partially a result of their desires to speak up and to seek acknowledgement for the tremendous efforts they have made. He also found that graduates of LIS programs reported having acquired qualities that would enable them to lead in management or work as library leaders. Therefore, ([Gul, Shah, Hamade, Mushtaq, & Koul, 2016](#)) supplemented that there were barriers to an underrepresentation of females in the management of libraries, such as maternal responsibilities to children, lack of female role models, and invisible barriers of a common perception that men should be the ones who lead. Then, women in libraries need more support to be in leadership positions.

Numerous studies have highlighted the issue of gender equality and representation in Library leadership positions. While there have been some improvements in the representation of women in library management, women still face obstacles, such as gender discrimination, family obligations, and biases. However, some scholars argue that there has been a recent feminist movement promoting female equality and providing equal career advancement opportunities. Despite this, the majority of librarians remain women and face persistent economic inequality, with men earning higher salaries in almost all experience cohorts. The gender pay gap is still a significant issue in the library field. However, a study based on data from the Association of Research Libraries (ARL) suggests that academic libraries have progressed in addressing this issue.

Trends in Librarian

The ever-growing number of publications adds to a massive amount of valuable

information. However, extracting useful information from such large amounts of data is a significant challenge for librarians ([Dastani, Chelak, Ziaei, & Delghandi, 2022](#)), including effectively extracting research topics and trends ([Cao, Cheng, & Liao, 2022](#)). This phenomenon increases the value of tools or facilities that allow us to extract information and knowledge from data easily ([Delen & Crossland, 2008](#)) because manual literature analysis is difficult or nearly impossible given the large volume of publications ([Cao et al., 2022](#); [Dastani et al., 2022](#)).

A trend can also become obsolete with the passage of time and the advancement of science, though some topics can last for a more extended period. Hot trends appear to be declining and focusing on mining information from social media to obtain valuable data ([Murray, 2015](#)). As a result, [Crampsie et al. \(2020\)](#) emphasise the importance of librarians being aware of current literature and trends to fill gaps.

There are several methods to see topics on documents. The new method utilises text mining, one of the popular topics among academic librarians in 2018 ([ACRL Research Planning and Review Committee, 2018](#)). The results of text mining and topic modelling can be used to examine the relationship between a topic and its evolution over time ([Dastani et al., 2022](#)). One of the well-known modelling topics, LDA, introduced by [Blei \(2012\)](#), is a statistical topic modelling to find topics from a collection of documents automatically ([Timakum, Kim, & Song, 2020](#); [Zhang & Kozak, 2019](#)). Meanwhile, BERTopic, an emerging methodology as described by ([Grootendorst, 2022](#)), has been frequently employed for abstract analysis in a compilation of scientific articles sourced from Scopus ([Gładysz et al., 2023](#); [Kukushkin, Ryabov, & Borovkov, 2022](#); [Mazzei & Ramjattan, 2022](#)). The mentioned studies offer valuable insights into the identification and exploration of the evolution of topics within female librarians on a global scale, through the utilisation of topic modelling.

Trend reports identify current issues in the field, and many of them will have an impact on the expertise needed to address those issues. Several studies have demonstrated various approaches for identifying trends, such as employing surveys and detecting trends in the academic sphere ([Luo & Tang, 2024](#); [Sanches, 2022](#)), bibliometrics to seek for technological trends in libraries ([Islam, Hu, Ashiq, & Ahmad, 2024](#); [Wang, 2023](#)), and using different methods to identify gender-related issues in LIS ([Bangani, 2024](#); [Choji, Cobo, & Moral-Munoz, 2024](#); [Siddique, Ur Rehman, Ahmad, Abbas, & Khan, 2023](#); [Zhang, Wei, Zhao, & Tian, 2023](#)). However, several other studies have shown that the analysis is limited to keywords ([Ashiq & Warraich, 2023](#); [Choji et al., 2024](#); [Islam et al., 2024](#)), while [Wang \(2023\)](#) used abstract analysis using word clouds, which reflect frequently appearing words. This demonstrates that analytical opportunities extend beyond keywords.

Despite being deemed important, only a limited number of librarians worldwide attempt to monitor the topic's global trend, especially among female librarians. The purpose of this study is to use topic modelling to explore topics of the female librarian in the abstract of research articles. Furthermore, the authors attempt to find the keywords used in each topic. The main contribution of this paper is to provide an overview of how librarians use text mining to discover trends in a field.

Method

Data Collecting

The methodology employed in this study is composed of three distinct stages. These stages include data collection, data cleaning, and the utilisation of topic modelling. To collect data, the scientific article database available on Scopus was utilised. Furthermore, the methodology described in the PRISMA 2020 statement ([Page et al., 2021](#)) was followed with the aid of a supporting application called Catchii ([Halman & Oshlack, 2023](#)). The flow

diagram, as depicted in Figure 1, offers a visual representation of this process. Prior to analysis via topic modelling, data cleaning was conducted using the Python library.

Data was obtained on August 25, 2023, through Scopus using search queries that incorporated preceding terms while also limiting searches to specific document types, such as articles, conference papers, and reviews. Furthermore, searches were not constrained by year and filtered to only include documents in the English language. Full query is available on the research data that we include in the Data Availability section. 125 records were successfully exported, followed by a review process utilising Catchii.

The preliminary examination yielded two data with identical titles and authors, resulting in the elimination of one of them. Further investigation revealed that 18 entries did not contain an abstract. A manual search was conducted, which successfully retrieved four available abstracts for these documents, while 14 others were excluded due to the absence of abstracts. Two articles were identified as irrelevant to the study after a thorough review of the abstracts, including articles from the *Journal of Wound, Ostomy and Continence Nursing*, and *Cornea*. Following a series of reviews, a total of 108 studies were obtained and subjected to a data-cleaning process.

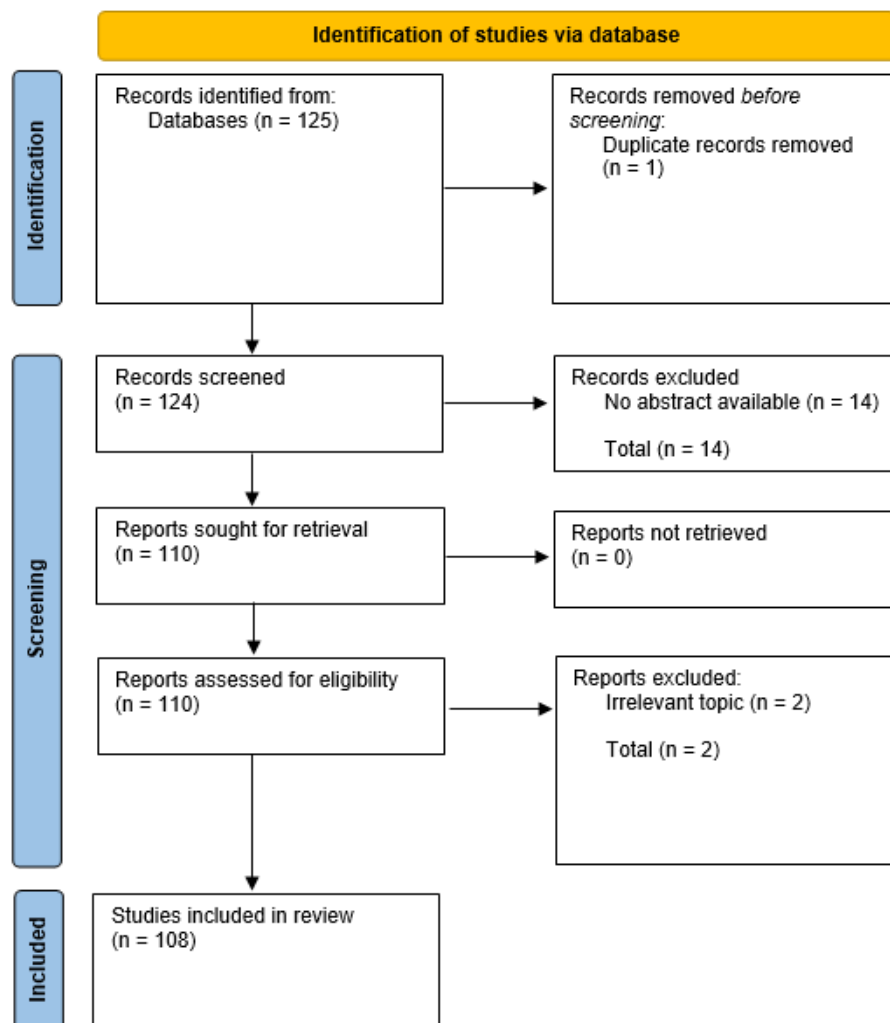


Figure 1. The PRISMA flow chart depicts the review employed in the study utilising Catchii.

Data Pre-processing

In this particular study, an analysis was conducted on the abstract in order to ascertain the need for cleansing, thereby ensuring that the resulting outcomes are optimal. To achieve this, lemmatisation was implemented using a Python library known as the Natural Language Toolkit (NLTK). It is worth noting, however, that lemmatisation does not have the capability of identifying synonyms. Therefore, words such as "women/woman" with "female" and "man/men" with "male" require additional modifications. We also implemented a number of measures to enhance the quality of the text analysis. Specifically, certain punctuation marks have been disregarded to prevent them from being counted as words, and all words have been converted to lowercase for consistency. Additionally, we have encountered several instances where copyright statements have been present in the abstracts, which were removed.

To further improve the accuracy of the analysis, we have made use of NLTK stopwords to exclude words that do not contribute significantly to the meaning of the text, such as "is", "are", and "or", as well as certain abbreviations and numerical expressions such as "e.g." and "2nd". Additionally, we have also excluded specific words such as "librarian" and "library" given that they are closely associated with the topic being discussed. In order to prevent document grouping based on geographical regions such as states and provinces, the current study chose to eliminate words specific to those areas. For instance, New South Wales, America, Iran, and Vietnam were among the excluded words. The corresponding word lists that underwent removal are available in the Jupyter Notebook files that we included with the research data.

Data Processing

To analyse abstracts, the utilisation of text mining techniques is employed through the implementation of BERTopic. This sophisticated topic model enhances the process of topic representation by implementing a three-step approach, consisting of document embeddings, document clustering, and topic representation ([Grootendorst, 2022](#)). Instead of relying on metrics such as coherence and perplexity, the present study concentrates on utilising manual evaluation of acquired outcomes. Several previous studies also emphasise the importance of human judgement over automated metrics alone ([Gao, Pandya, Agarwal, & Sedoc, 2021](#); [Hoyle et al., 2021](#); [Simonetti, Albano, Plaia, & Tumminello, 2023](#)). To facilitate manual evaluation, the k-Means clustering algorithm was employed, whereby a range of values between 5 and 9 were examined to ascertain the optimal outcome. Additionally, the use of UMAP (Uniform Manifold Approximation and Projection) was incorporated in this study. [Allaoui et al. \(2020\)](#) discovered that UMAP is effective when used in conjunction with algorithms like k-Means to enhance clustering precision.

This study also attempts to comprehend keywords by employing VOSviewer to examine the correlation among each topic. Previously, author keywords were cleaned using the Coconut Library Tool and OpenRefine. Furthermore, the 2 topics that have the highest level of similarity on BERTopic will be explored. The abstract will be filtered using the top 5 topic words for each topic, resulting in a collection of abstracts that will be further examined using the scattertext, a Python library created by [Kessler \(2017\)](#).

Result and Discussion

After conducting several experiments, we determined that there were six topics selected with a distribution of the top five words shown in Figure 2. Topic 0 and topic 3 share the most similarities between them, with a value of 0.85 (Figure 3), followed by topic 1 and topic 3 with a value of 0.83. The topics with the highest degree of diversity are topic 0 and topic 5, both of which have a value of 0.46. Meanwhile, using VOSviewer, a keyword network

consisting of 203 nodes is formed, of which only 161 nodes are connected to each other. Three keywords (librarian, female librarian, and female) appeared more than five times overall, with "librarianship" and "gender" taking the fourth and fifth ranks. In general, there are no standout nodes in the 2020s. However, there are several yellow nodes that appear for each topic, occurring between 1 to 2 times.

The assumption made by Topic that one document represents only one topic is a weakness, as a single document may contain multiple subjects ([Grootendorst, 2022](#)). This weakness is demonstrated by the keyword network that forms when multiple topics intersect (Figure 4). While every subject may have trending keywords, there are no dominant topics that have taken centre stage and are being widely discussed. Recently, there has been a lot of attention on "job satisfaction," which has appeared three times, while "glass ceiling" and "gender pay gap" have each been mentioned twice. The glass ceiling is a topic that can be viewed from various angles. [Eva et al. \(2021\)](#) linked it to gender inequalities and salary gaps, while [Adekoya \(2020\)](#) argued that it prevents female librarians from advancing to managerial positions. Based on the topics provided, it is evident that topic 0 and topic 1 were frequently discussed in relation to the issues confronting female librarians.

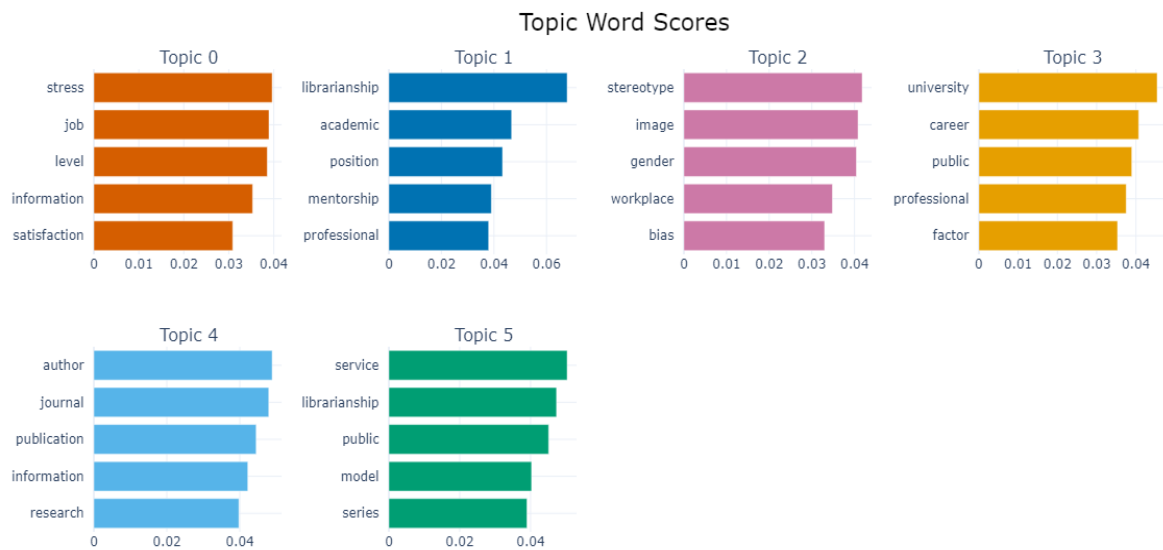


Figure 2. The top words for each of the 6 topics.

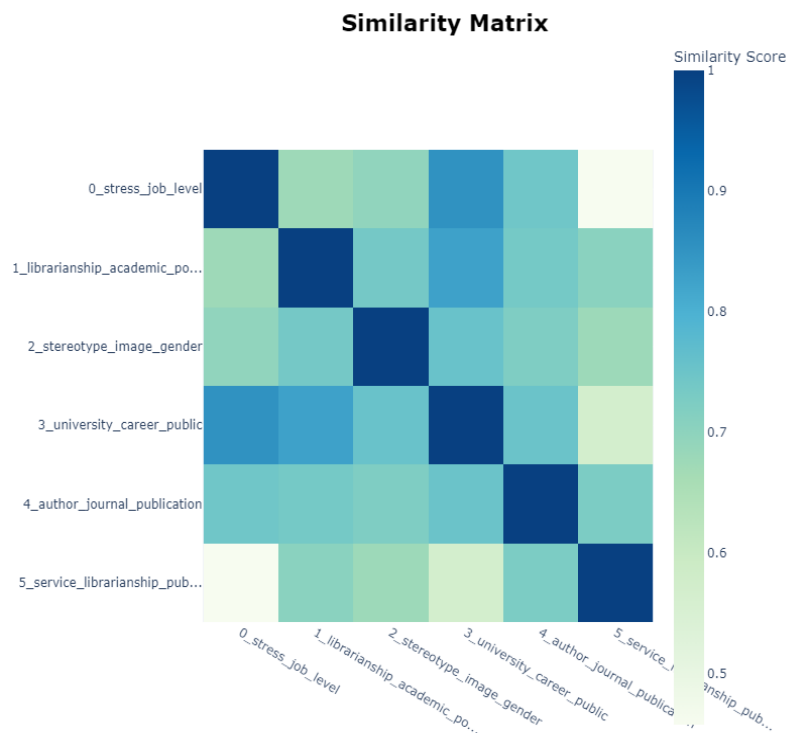


Figure 3. Similarity results among topics

Further exploration was conducted on topics that had a high level of similarity, specifically topics 0 and 3. This was achieved by filtering abstracts that contained at least one word from the top 5 words. Topic 0 consisted of 61 documents, while topic 3 had 83. Both topics lacked distinctive words, as indicated by the plots, which tended to cluster in a diagonal line from the bottom left to the top right (Figure 5). "Stress" was the top word in topic 0, with a score of 0.2227. Although it was an average word in topic 0, it was below average in topic 3, which had the top word "management" with a score of 0.3182. Words such as "job" and "satisfaction" are also coloured blue, indicating topic 0, while "university", "career", and "factor" are in topic 3, coloured red.

Topic 0 explores the interplay between stress associated with one's occupation and the general contentment derived from it pertaining to a work-life balance. Various factors play a role in determining the well-being of librarians. These factors encompass aspects such as work/life balance, stress levels, hours worked, personal fulfilment, and job satisfaction (Galbraith, Fry, & Garrison, 2016). The study's data reveal notable differences in well-being between male and female employees within the field of librarianship. This contrast is particularly pronounced in faculty institutions, where disparities in stress levels and work/life balance between genders are more apparent. Olorunfemi & Adekoya (2023) further explore the concept of "technostress," emphasising the effects of information and communication technology on stress levels. A study by Howlett (2019), which focused on work-life balance, job satisfaction, workplace stress, and personal fulfilment, identified two pivotal factors—weekly working hours and years of service at the library. Both of these factors had significant impacts on work-life balance. The study concluded that supporting workplace flexibility and well-being, especially among librarians at Association of Research Libraries (ARL)

institutions, is essential for reducing stress and fostering work-life balance in this professional setting. Building on these findings, a study by [Rutledge \(2020\)](#) on women academic librarians found that balancing work and family life was one of the most prevalent challenges reported. Other challenges highlighted in the survey included acquiring new managerial skills, reshaping their self-perception to see themselves as managers, and navigating political intricacies.

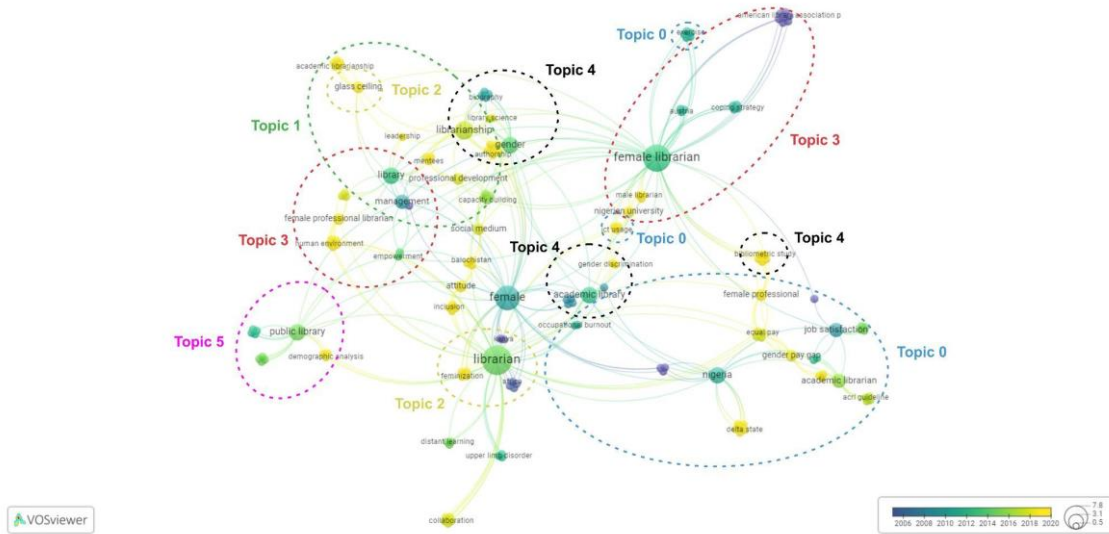


Figure 4. Visualisation of keyword networks grouped by topics

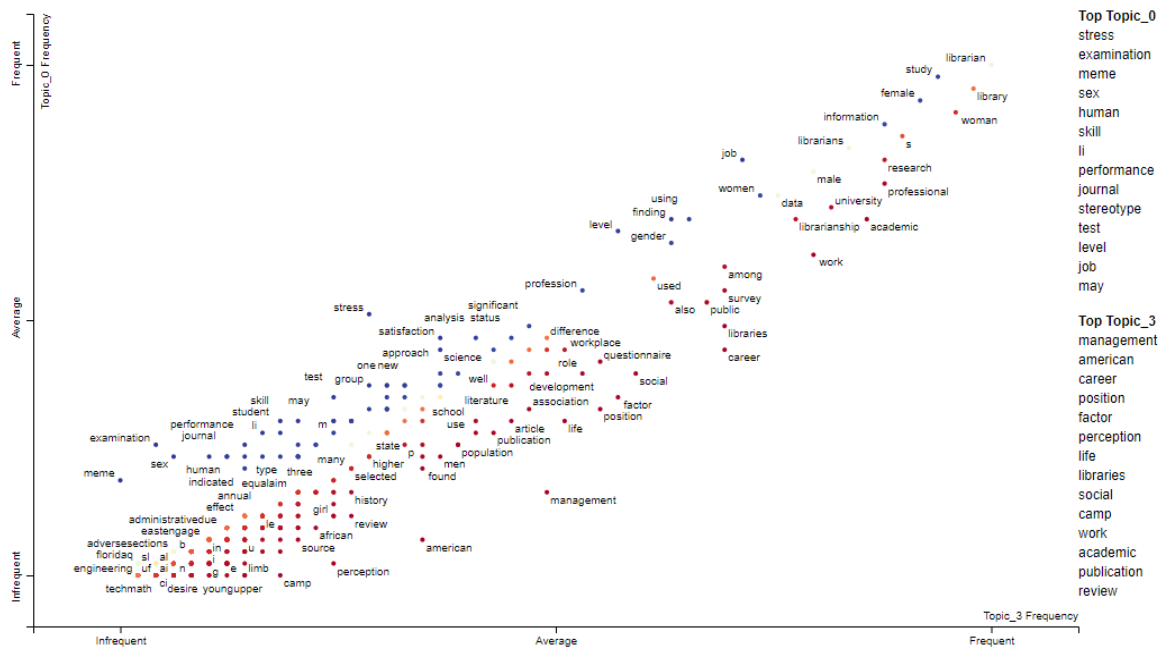


Figure 5. Scatter plot of words in topic 0 and topic 3 using scattertext

Topics 1 and 3 discussed career advancement and professional development (Figure 2), and the two topics have a meaningful relationship (Figure 3). According to [Abu-Tineh et al. \(2023\)](#), these two factors are aligned to advance professionals as they enable individuals

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to gain more experience and knowledge, thereby advancing their careers. The ability to adapt to the actual work environment with the help of a mentor is one way to advance one's professional development ([Adekoya & Fasae, 2021](#)), as mentorship is one of the top 5 words in Topic 1. In the keyword network (Figure 4), it's also evident that "professional development" is related to keywords such as "mentorship", "mentor", and "mentees", whereas "career development" is connected to "mentoring". There are several factors that may limit the career advancement of a librarian such as the lack of educational advancement ([DeLong, 2013](#)), such as obtaining a higher degree, some also mentioned glass ceilings ([Adekoya, 2020](#); [Ashiq & Warraich, 2023](#); [Eva et al., 2021](#)), hinders career advancement. The studies of [Eva et al. \(2021\)](#) and [Saleem & Ameen \(2021\)](#) found that women who work as librarians in academic and public libraries earn less money than their male counterparts at the same institution. These studies also revealed that women exhibit higher standards of behaviour in the workplace than men do. In addition, several factors were identified for fostering professional advancement for female librarians, such as networking programs and mentorship programs, that can assist women in successfully navigating their careers and gaining access to job prospects ([Ekoko & Ikolo, 2021](#)). Then, we concluded that Topic 3 related to Topic 1 as both discussed the significant factors that contribute to the advancement of female professional librarians.

Topic 2 delves into the stereotypes and gender perceptions related to male and female librarians, significantly influencing the perception of the profession. As suggested by [Singh et al. \(2020\)](#), these gender stereotypes persist in both digital media representations and societal discourse. To provide historical context, women first entered the field of librarianship in various countries, including Australia in 1899 ([Biskup, 1994](#)), Britain in 1865, and the USA in 1852 ([Sakr, 2011](#)). While the number of women occupying prominent roles within the profession has increased over time, these transformations signify a notable shift in the perception of the profession and the emergence of evolving gender-related issues, particularly within the framework of 'feminised' librarianship ([Biskup, 1994](#)). However, [Neville's \(2023\)](#) study on the representation of stereotypical female librarian images in memes underscores the continued objectification and gender stereotyping of female librarians, thereby emphasising the persistent challenge of feminisation within the field. Within this context, stereotypes continue to perpetuate the belief that men are superior decision-makers, despite women's decision-making roles within their households ([Burrington, 1984](#)). Furthermore, [Akpebu Adjah & Van Der Walt's \(2019\)](#) study emphasises the gender gap in career progression, with many women making career sacrifices to meet societal expectations. Gender bias and discrimination present substantial challenges, limiting leadership opportunities for female librarians and impacting their well-being, especially concerning work/life balance and job-related stress ([Ashiq & Warraich, 2023](#); [Howlett, 2019](#)).

Topic 4 highlights the important role of women in librarianship as authors, researchers, and contributors to scholarly communication. Their historical involvement in these domains highlights the imperative of amplifying their voices across various fields ([Cockett, 1996](#)). [Omotayo's \(2006\)](#) research underscores women's contributions to scholarly communication, particularly in advocating for peace and reconciliation, with a focus on Nigeria. In the United States, women promote library services and introduced innovative survey-based research methods welcomed and embraced women's voices as valued colleagues in librarianship ([McDowell, 2009](#)). Additionally, U.S. librarians excel in addressing various information challenges, such as acquiring materials, enabling information access, conducting research, teaching research methodologies, and supporting students ([Westbrook, 2003](#)). There is a notable transformation that occurred when women authors collectively outnumbered men suggesting a positive trend in female authors' growth and contributions to scholarly journals

([Awasthi & Sukula, 2021](#); [Terry, 1996](#)). This shift in gender representation was further examined by [Fennewald \(2007\)](#), who noted that female academic librarians were more likely to be presenters at conferences, suggesting a potential pathway from presentations to future publications. [DeLong \(2013\)](#) emphasised gender differences in career paths, noting that male chief librarians often entered the profession later but published more frequently. This observation was reinforced by [Tsafe et al. \(2016\)](#), who found a significant publication gap between male and female librarians, with leadership positions associated with higher publication rates. These findings depict a complex evolution of gender dynamics within the academic library profession, with women making significant progress in presentations and authorship. Nevertheless, significant challenges, including administrative, financial, and skills-related issues and cultural norms prioritising household duties over research, pose barriers to women's pursuit of scholarly endeavours ([Ashiq & Warraich, 2023](#)), as discussed in Topic 2 regarding stereotypes and gender perceptions.

On the last topic, the results showed a group of documents related to services in libraries provided by female librarians with a focus on public libraries, including both direct services facing users and behind-the-scenes technical services. However, despite the majority of library students being women, there was a tendency for female librarians to be reluctant to fill technical positions ([Lee & Morfitt, 2020](#)). Female librarians also face cultural expectations to care for children ([Anunobi, Ukwoma, & Ukachi, 2012](#); [McDowell, 2009](#)), which created a gap for them to fill technical positions instead of just focusing on children's services. [Ballestra & Cavaleri \(2016\)](#) noted that female librarians still had less confidence than male librarians in areas such as financial literacy, while [Anunobi et al. \(2012\)](#) explained that there was also a gap in technology usage. These shortages make female librarians invisible in their environment. To assert their position, female librarians tend to collaborate with male librarians ([Anunobi et al., 2012](#); [McDowell, 2009](#)). Female librarians can gain real-world experience through means such as mentorships ([Lee & Morfitt, 2020](#)), as mentioned in topic 1. This also demonstrates how one topic and another topic are related and interconnected.

Conclusion

The discussion on female librarians is divided into several major topics. One of the topics discussed is professional and career advancement, considering the need for women to increase their visibility and position in libraries. However, there are still obstacles such as glass ceilings and limited educational opportunities. Another topic discussed is work-life balance, which emphasises the importance of addressing stress and job satisfaction to create a healthier work environment. The existence of a knowledge gap in library services, particularly in the field of technology, also raises concerns among female librarians. [Olorunfemi & Adekoya \(2023\)](#) refer to this as technostress. Additionally, stereotypes surrounding the female librarian profession are still being discussed. These stereotypes relate to gender issues and portray women as feminine creatures or as figures who are similar to children in our culture.

This study also aims to examine the correlation between different topics. Instead of each document reflecting only one entity, in-depth analysis reveals that each document actually encompasses multiple topics of discussion. The formation of a keyword network can provide insight into the relationship between various topics; however, the clusters generated are not always within the same topic and reflect the analytical decision between keywords or abstracts; even combining the two can produce different outcomes.

This study is limited to the use of BERTopic, which has stochastic characteristics, making it difficult to replicate. Furthermore, the database is restricted to Scopus, therefore it does not represent the full research, as many publications are not indexed in this database.

In addition, comprehensive research should be conducted by comparing various topic modelling algorithms such as LDA or Biterm. Moreover, larger datasets from sources such as Lens or Google Scholar, as well as documents in many languages, should be considered.

Data Availability

Data associated with this study can be accessed on doi.org/10.5281/zenodo.10086961.

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Authors' Contributions

SA: Writing – original draft, Writing – review & editing, Formal Analysis, Conceptualization; RA: Writing – original draft, Writing – review & editing, Formal Analysis, Conceptualization; FAS: Writing – review & editing, Methodology, Visualization, Data curation, Formal Analysis.

Conflict of Interest

All authors have no conflict of interest related to this study.

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