Accountancy Business and the Public Interest
ISSN: 1745-7718

Volume: 40
Issue Number:01

EVOLUTION OF NEUROLEADERSHIP: BIBLIOMETRIC ANALYSIS AND NETWORK VISUALIZATION

MS ANJALI CHOUDHARY[1] and PROF. JAYA BHASIN[2]

[1]Research Scholar, Department: HRM & OB, Central University of Jammu.
Email: anjali14choudhary@gmail.com
[2]Dean School of Business Studies, Department: HRM & OB, Central University of Jammu.
Email: jaya.hrm@cujammu.ac.in

Abstract

Neuroleadership construct has been reported as an essential element in the management research in both Western and Eastern literature. Developing frameworks for leadership have been elaborated in contemporary studies to provide solutions to leadership difficulties in learning organizations. The paradigm shift that is emerging in current leadership theory contends that leaders are anticipating and meeting the needs of their community, in contrast to earlier conceptions of leaders where leaders have been viewed as heroic figures. This paradigm shift indicates that a leader must switch from a perspective of serving others to one of being served. Leadership studies have become more popular as a result of the collaboration between the fields of neuroleadership and leadership. Based on neuroleadership, itis essential for a leader to learn how the mind of an individual functions in order to increase thinking, decision making and enhance employee's creativeness, rather than simply instructing him or her to do. Based on this, a bibliometric analysis methodology has been carried out for reviewing literature on leadership. The current topic holds contemporary and interdisciplinary relevance and helps in filling the gap in the existing literature. VOS viewer software has been utilized for conducting bibliometric analysis in this study. The key authors, who are pioneers in the area, the countries that have been leaders in the area of neuroscience, and leadership studies have been investigated for providing direction to the existing literature.

Keywords: Neuroleadership, Neuroscience, Leadership, Decision Making, Bibliometric Analysis, VOSviewer.

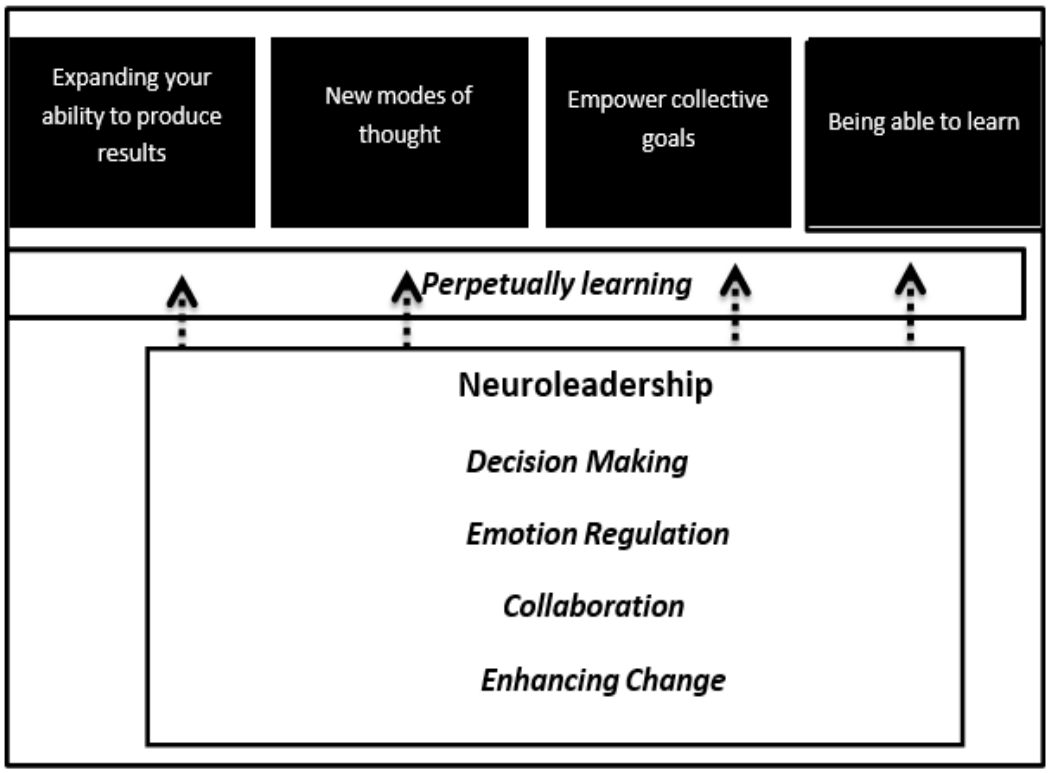
INTRODUCTION

The dynamic environment we live in necessitates for a leader to be able to maximise brain function and learning in order to keep up with the pace of the outside world and maintain long-term effectiveness. Everything a person does, feels, or thinks is irrefutably stored in his or her brain, so it is crucial for a leader to have a solid understanding of how the brain works in order to get the desired outcome from their team members. According to Luiz Pessoa scientists should make a conscious effort to comprehend the brain as an evolutionary multifaceted system (Pessoa, 2023). Neuroleadership has therefore emerged as an area which focuses on the neuroscience and also explains how our brain functions and how business and management can benefit from it .Leaders can enhance learning skills, keep their businesses updated with trends and even develop them by following the neuroleadership principles. Through the application of neuroscience findings, neuroleadership aims to develop the discipline of leadership (Gocen, 2021).David Rock, a global leadership consultant, coined the term "neuroleadership" in 2006 by fusion of two terms, Neuroscience and Leadership. Neuroleadership is an emerging area of study that is based on research conducted on neural science and it explains how the mind works with the goal of raising standards, fostering leadership. It also studies four key facets of leadership including decision-making, problem-solving, emotional regulation, teamwork, and change facilitation (Rock, 2006). The utilization of neuroscience is the primary emphasis of the field of neuroleadership in management education, instruction as well as how the neuroleadership approach may enhance management practises, change leadership, Innovative thinking, and employee engagement (Schaufenbuel, 2014). Neuroleadership, according to neuroscience, investigates

how research ideas and outcomes might be utilized in theenormous area of leadership such as decision-making, trust; self-management, social interaction, collaboration, influence, strategy, and organizational behavior. Research suggests that majority of organisations consider rationality to be the foundation of effective decision-making processes. The paradigm shift and new perspective offered by neuroleadership examine how emotions affect decision- making. Our entire body is interconnected with the brain, and knowing how it functions can help us better comprehend how people behave. Neuroscience research has revealed that the brain is an organised organ that is primarily concerned with survival and rewards. It further states that the unconscious side of the brain is far more strong as compared to the conscious side, that psychological states are an essential component of the brain, that experiences determine our behaviour, and that the brain behaves logically on the inside even if it seems unreasonable on the outside (Ringleb & Rock, 2008). According to David Rock the emerging field of neuroleadership provides an insight into neuroscientific knowledge which can be applied to consulting, coaching, management, and change management (Rock 2006). Neuroleadership study in the area of neuroscience will help in organizing and promoting neuroscience discoveries pertinent to excellent leadership practices. It shall also support practitioners and leaders in their attempts to develop personality of the leaders. It is important to understand how the brain functions will enable us to better describe mental, behavioral, and interpersonal experiences and thus boost performance (Rock, 2006). Although the application of neuroscience to management and leadership is relatively a new field, there are already a significant number of management and leadership-related approaches with regard to organisational and managerial application. The SCARF model by David Rock is based on the observation that the brain is generally preoccupied with sustaining and enhancing rewards while averting unpleasant behaviours and experiences (Rock, 2008). Based on the SCARF principle, the Neuroleadership Institute established a self-assessment for assessing individual motivational characteristics (Rock, 2022).Workplace behaviours and motivations change when rewards are the primary focus and unpleasant experiences are avoided. The model focuses on the following five categories: status, certainty, autonomy, relatedness, and fairness. Elger (2009) describes the reward system, emotional system, memory system, and decision-making system as the four fundamental brain systems. The study of neuroleadership has recently attracted the interest of academics. However, very few studies on this subject have carried out a systematic literature review, and those that have only performed a partial analysis of the literature. Kuhlmann &Kadgien (2018) examine the new themes in the literature on neuroleadership, and then highlight a few of its theoretical gaps potential applications, and outcomes. Issac & Issac (2020) conducted a bibliomorphological analysis to examine the interdisciplinary interactions between leadership studies and neuroscience. Gocen, (2021) analysed 44 studies that were published between January 2010 and May 2020 as part of a systematic review of the literature on the managerial and educational implications of neuroleadership. We suggest a literature review that integrates the two fields of neuroscience and leadership and uses the term "neuroleadership" in order to complete the earlier reviews. Additionally, the most recent years are covered, and the analysis is completed through 2023, providing an analysis for all years and sub-periods. With the help of bibliometric analysis carried out with the support of VOSviewer software, this study aim to review the current investigation on studies that highlight the role of neuroleadership in the field of leadership research in order to identify the relevant research gaps that remain open for further investigation to understand the current role of neuroleadership in the research. Several research studies published in the field of neuroleadership from the last ten years have elevated themselves to a higher pedestal. We contend that an extensive and cohesive bibliometric review is needed to identify the key

research dynamics and the evolution of neuroleadership research. As a result, we can see where it started, where it has been, and where it should go. This study employs a bibliometric approach to provide an extensive review of existing research on neuroleadership. The goal is to present a structured, quantitative, and objective analysis of existing neuroleadership research. As a result, we can identify some potential areas and research gaps that future researchers can consideration primary goal is to detect the trends and prospects in the field of neuroleadership, data included all publications from 1996 to 2023. This reduced the possibility of seminal work being excluded from the data set.

Figure 1: The framework of Neuroleadership



Source: Grah& Dimovski, 2014

METHODOLOGY

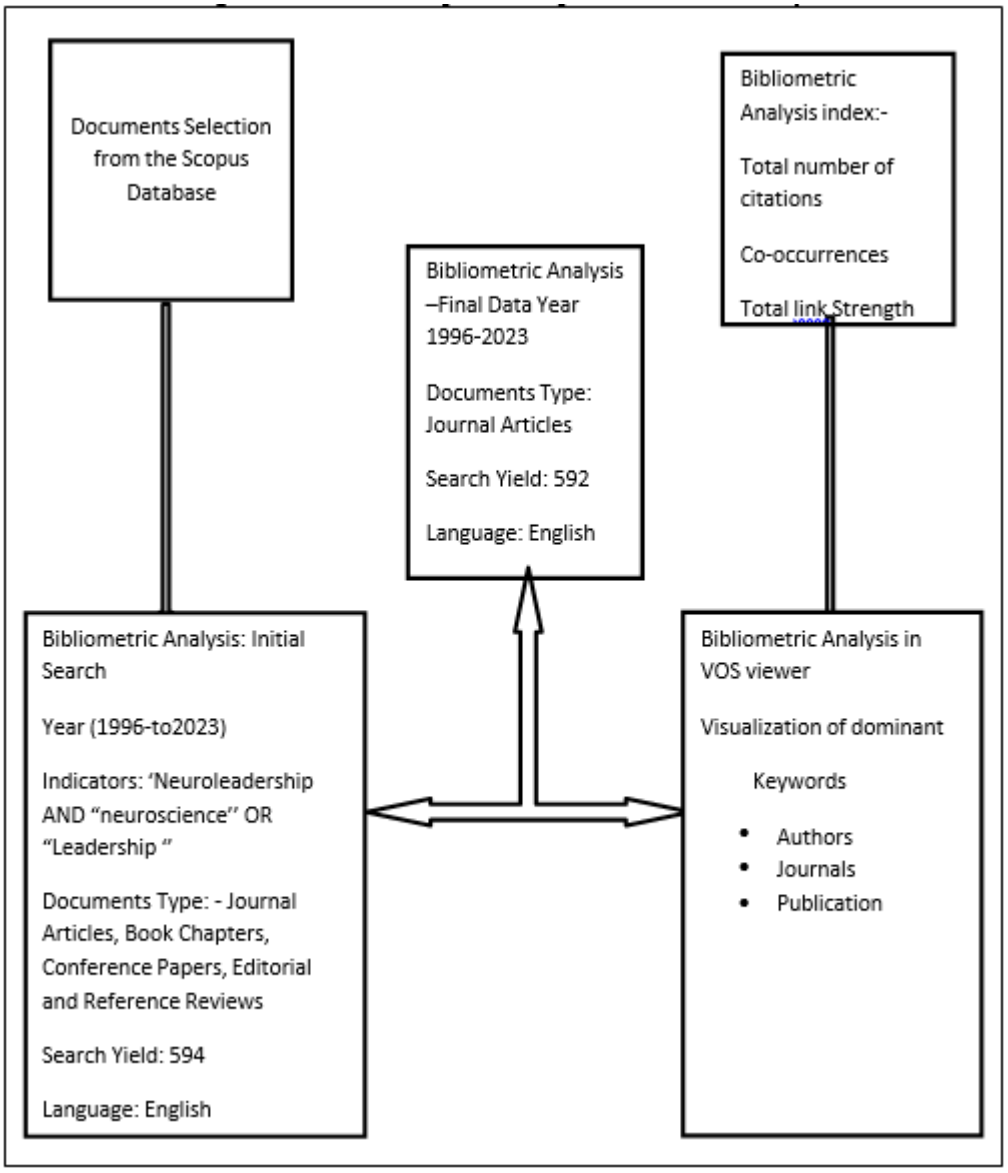
Bibliometric analysis is a statistical analysis that is used for quantitative evaluation of publication in an area of study (Mayr & Scharnhorst, 2014).Multiple methods, including statistical and mathematical ones, are utilized in bibliometric research for evaluating bibliometric data (Donthu, 2021). Bibliometric analysis emerged from quantitative literature study in the early 1900s, and bibliometric-based studies have been used extensively in academic research (Diem &Wolter, 2013). Furthermore, this method assists researchers in determining the most recent developments in a specific field and forecasting the field's possible future direction (Chen, 2016). Research studies in the field of neuroleadership have been organized and examined using bibliometric analysis. Due to the emergence of a few techniques for analyzing scientific databases, such as bibliometric (Yoon & Lee, 2012), Scientometrics (Mingers &Leydesdorff, 2015) and meta-analysis (Kipper,et.al., 2020), the bibliometric analysis was earlier carried out manually. Another bibliometric technique is science mapping analysis, which visualizes the relationships between various scientific actors spatially (Gaviria Marin et al., 2019). Performance analysis, on the other hand, looks at the

contributions that study, participants have made to a certain field (Donthu et al., 2021). In business research, most of studies have either been centred on science mapping (Hallinger & Kovacevic, 2019) or performance analysis (Brown, Park, and Pitt, 2020), with just a small number of studies (Gaviria-Marin et al., 2019) using both approaches. The performance of various research indicators, such as individuals, organizations, nations, and journals, is frequently presented in reviews. As an outcome, performance analysis is present in the majority of evaluations, even those that don't use science mapping (Donthu et al. 2021). On the other hand, co-authorship analysis, theme mapping, coupling maps, co-occurrence of keywords, and analysis of co-citations also feature in science mapping. Data from several bibliographic databases, including Web-of-Science, Scopus, and Google Scholar, are needed for the bibliometric study. Google Scholar and Web-of-Science are two popular databases used for bibliometric analysis; nevertheless, Scopus performs better than Web-of-Science in terms of the number of journals included andcitation analysis (Falagas et al., 2008; Zyoud et al., 2015). PubMed and Web of Science do not include the same variety of journals as Scopus, and Scopus citation analysis is quicker and includes more articles than Web-of-Science's. So, in order to extract the metadata pertaining to research on neuroleadership, for the current study Scopus data has been used. The keywords such as Neuroleadership or Neuroscience, leadership and neurobehavioral, Neuroeducation have been used to extract the data from the Scopus data base. The title, keywords, and article itself were used in the search. Boolean operators like 'and or' were used to combine keywords in a search to narrow the search to the most relevant results. The following search criteria were used, and 592 records were found. Using the filter, the search was limited to the subject area, source, title, keyword, source type, and language.

DATA ANALYSIS

VOSviewer software (Van Eck &Waltman, 2014) has been used for bibliometric analysis on data that was taken from the Scopus database. Although bibliometricianscan use a variety of software tools to analyses or visualize the data, the choice of tool is dependent on the type of analysis that is needed (Dervis, 2019). VOSviewer presents bibliographic data on understandable maps, including co-authorship, citation, bibliographic coupling, keyword co-occurrence, or co-citation maps based on bibliographic data. This bibliometric study examined the field of neuroleadership by examining articles published in sources with a Scopus database between 1996 and March 2023. To locate and retrieve bibliographic data related to the papers published in Neuroleadership, the Scopus index was used. Scopus database was chosen as it offers a greater number and variety of sources on neuroleadership than other databases and has been utilized in previous bibliometric studies by researchers. Data retrieval was done on 12th March 2023. The search queries generated 592 documents published between 1996 to March 2023. The results were screened for duplicates and finally upon finding none, a total of 592 articles were included in the data analysis.

Figure 2: Bibliometric process implemented in the study



Source: Author's Compilation

RESULTS

Co-occurrence of keywords: VOSviewer software was used to analyse the relationship between keywords. The analysis revealed the presence of 4 clusters (colour red, green, blue, and yellow) that indicated the relationship between the keywords. VOSviewer can visualize bibliometric mapping in various ways, such as network visualization (as shown in Figure 3) and density visualization (as shown in Figure 4). The keywords were represented by circles of different colours, and the size of the circles was directly proportional to the frequency of their appearance in the titles and abstracts. The analysis in the co-occurrence mapping involved considering all keywords as the unit of analysis, using the full counting method. However, a minimum of five occurrences of a keyword was set as a limiting factor, resulting in only 304 keywords being analysed out of the initial 3398. Each keyword was analysed using software to determine its co-occurrence with other keywords, the total link strength

(cited references) and the number of occurrences in articles. The study identified the most frequently co-occurring keywords, which were, neuroscience, leadership, and decision making, with total link strengths of 3144, 2921, and 1046 respectively as shown in table (1). Network visualization illustrated the co-occurrence of the keywords and identified four clusters: red, green, blue, and yellow. The prominence of the circles and texts in each cluster indicates their strength of co-occurrence, while the distance of the items and the lines represent the linkages of the keywords, respectively. The study had some limitations, such as the minimum threshold for keyword occurrences, which influenced the analysis results.

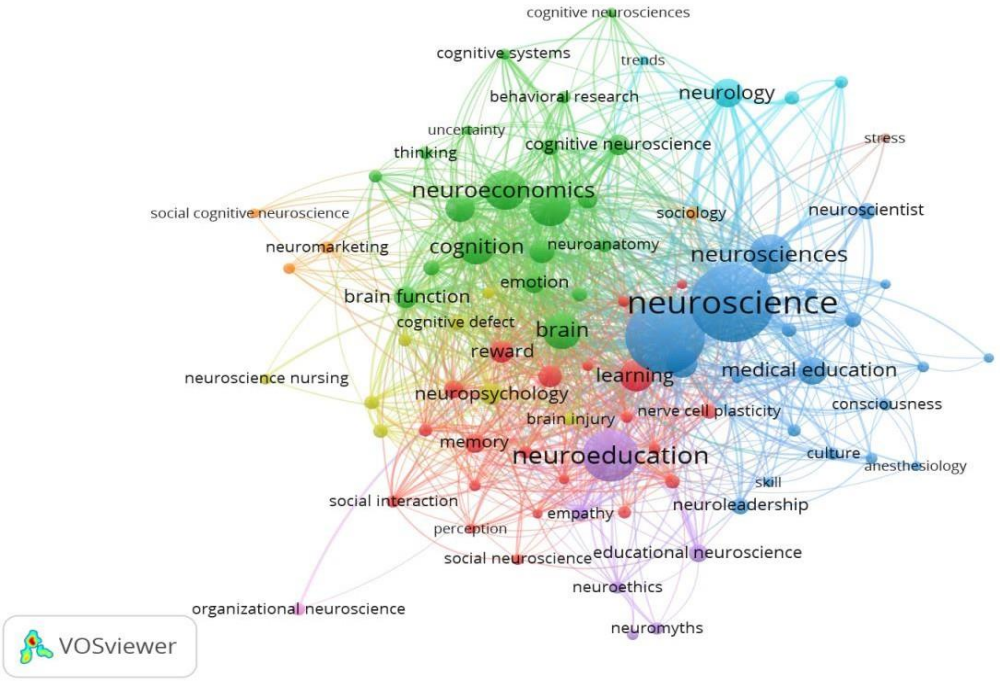


Figure 3: Visualization of co-occurrence of keywords using VOSviewer using network visualization

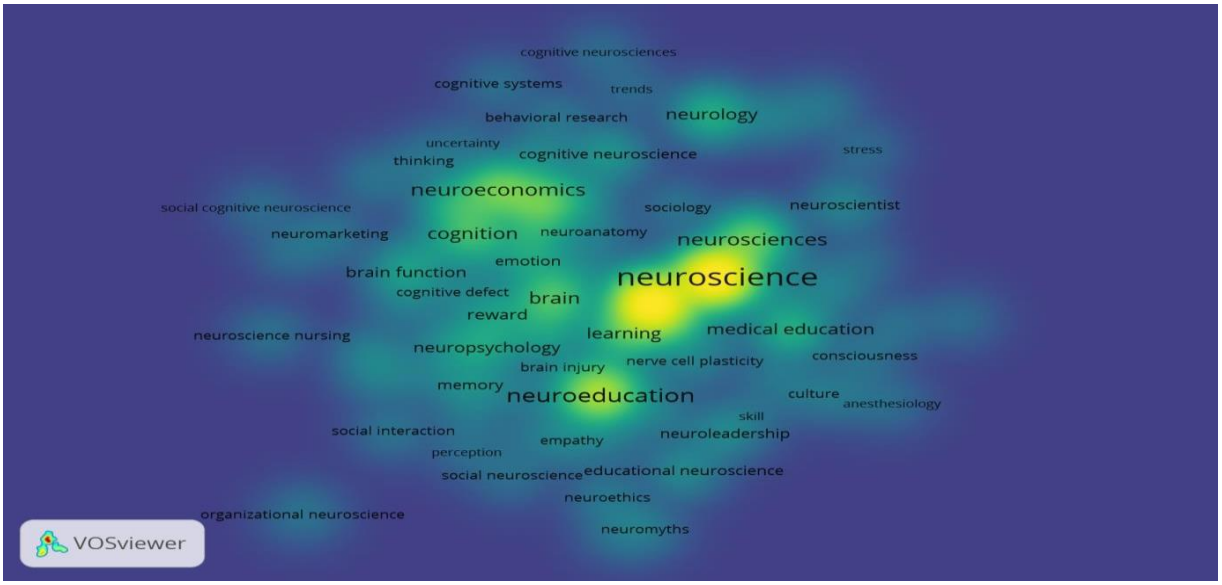


Figure 4: Visualization of co-occurrence of keywords using VOSviewer usingdensity visualization

Table 1: Most highly co-occurring keywords

Keywords	Occurrences	Total link Strength
Neuroscience	278	3144
Leadership	247	2921
Decision Making	67	1046
Neuroeducation	123	627
Cognition	49	761
Neuroleadership	14	80
Behaviour	26	464
Reward	23	405
Emotion	13	147
Memory	17	231
Awareness	11	203
Knowledge	10	173
Empathy	11	169
Intersectoral collaboration	7	122
Behaviour Change	5	113
Social Interaction	7	110
Problem solving	7	102
Thinking	7	101
Creativity	6	92
Educational neuroscience	15	91
Trust	6	89
Uncertainty	5	88
Consciousness	7	60
Emotional intelligence	6	25
Leadership development	5	6

Bibliometric analysis of the co-authorship: The neuroleadership papers involved a group of 1245 authors, including cooper j.i. The main collaborators were Brick & monmia and their total link strength was 52, as shown in Figure 5. Research on domestic and international literature shows that among 1032 organizations, Department of neuroscience, university published the most papers (as shown in Table 2) in this field, with total link strength of 19 and citations of 70. Other department like hearing and Speech University, Otolaryngology University, Philosophy University, and the Institute of Philosophy published 1 paper each with link strength of 16. As indicated in the Figure 6 the network visualization method known as "density visualization of organizational collaboration" in VOSviewer displays the density of partnerships between organizations in a particular industry. Organizations are symbolised by nodes in this graph, while partnerships between them can be seen as links. The power of the relationship can be seen by the linkages' thickness, and the number of publications each organization has published is indicated by the size of its nodes. The areas (yellow) where connections are tightly packed together show the density of partnerships by the darkness, with darker areas representing denser collaboration. The collaboration patterns of the majority active organisations in a given field can be determined with this visualization. Additionally, it can highlight groups of businesses that collaborate closely as well as those thatoperate in more solitary environments.

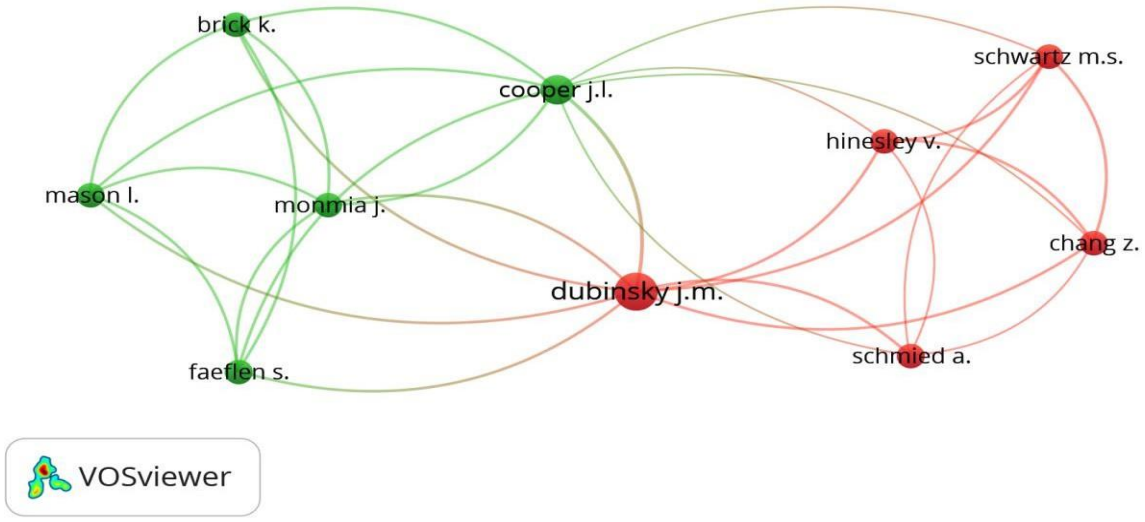


Figure 5: Visualization of Co-authorship of network using VOSviewer using network visualization

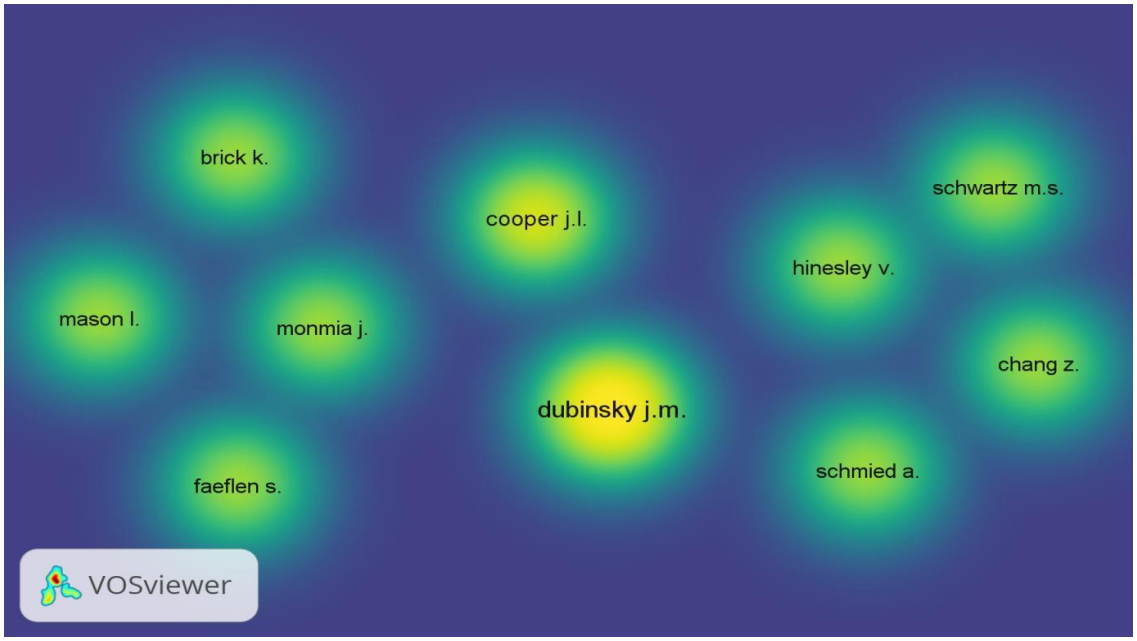


Figure 6: Visualization of co-authorship of network using VOSviewer usingdensity visualization

Table 2: Link strengths of the organizations

Organization	Documents	Citations	total link strength
Department of neuroscience,university	5	70	19
Department of hearing and speech , university	1	534	16
Department of otolaryngologyHead.	1	534	16
Department of otolaryngologyHead	1	534	16
Department of philosophyuniversity	1	534	16
Department of psychology	1	534	16
Department psychology university	1	534	16

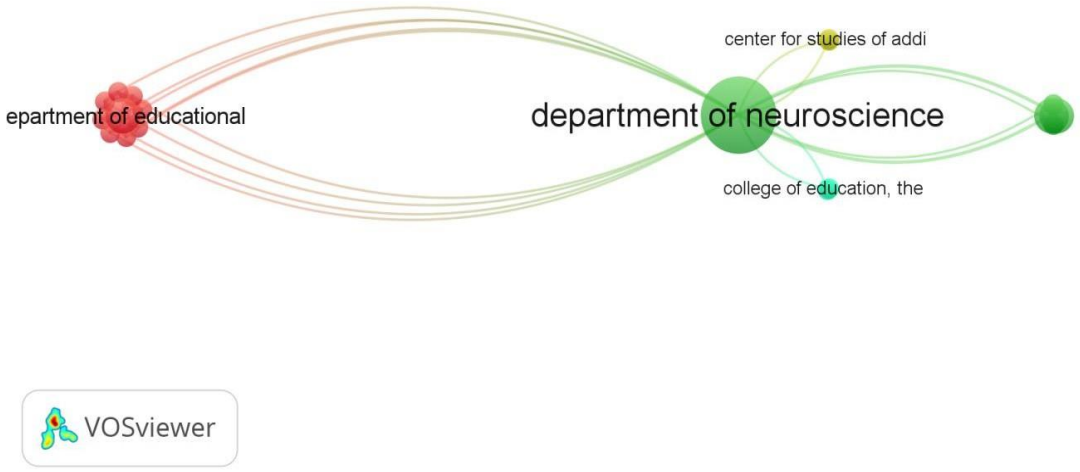


Figure 7: Visualization of Organizational collaboration network using VOSviewer using network Visualization

Table 3 indicates that United States emerges to be the most active country in terms of research in this area with a total publication of 71 and citations of 1447 with total link strength of 15. United Kingdom is placed at the 2nd position with 32 papers, 331 citations and total link strength of 2. The co-authorship analysis network for countries of Figure 8 is a network visualization that shows the collaboration patterns between countries in terms of their research publications. In this network, nodes represent countries, and the links represent co-authorship relationships between them. The size of each node is proportional to the number of publications authored by that country, while the thickness of the links represents the strength of co-authorship between two countries. The colour of the nodes can represent different attributes such as geographical location, language, or economic development level. This network can help researchers to identify patterns of collaboration between countries, such as which countries tend to collaborate more frequently, and in what areas of research. It can also be used to identify potential collaboration partners, prioritize research areas, and allocate funding. The co-authorship analysis network for countries in VOSviewer can provide a useful visual representation of the complex relationships between countries in terms of research collaboration, and can help to guide policy decisions related to research funding and collaboration. United States and United Kingdom emerge to be the most collaborative countries in the terms of publications as indicated in Figure 8 which can be observed by the size of the nodes for the two countries. The density visualization of co-authorship analysis for countries of Figure 9 in VOSviewer is a network visualization that shows the collaboration patterns between countries in terms of their research publications. In this visualization, nodes represent countries and links represent co-authorship relationships between them. The thickness of the links represents the strength of co- authorship, while the size of the nodes represents the number of publications by each country. The density of collaborations is shown by the darkness of the areas where codes are clustered together, with darker areas indicating denser collaboration. This visualization helps to identify the most collaborative countries in a given field and their patterns of collaboration. It can also reveal clusters of countries that work closely together and those that are more isolated. This visualization can be useful for policymakers, funding agencies, and researchers to identify potential collaborators, prioritize funding, and target areas for further research.

Table 3: Research in Various Regions

Country	Documents	Citations	Total LinkStrength
United States	167	6394	60
United Kingdom	59	1279	32
Turkey	5	7	2
Switzerland	12	1374	29
Spain	53	253	15
Russian	5	3	3
Netherlands	10	883	16
Mexico	5	19	2
Japan	7	157	3
Italy	28	388	27
India	7	216	12
55Greece	11	16	5
Germany	25	553	24

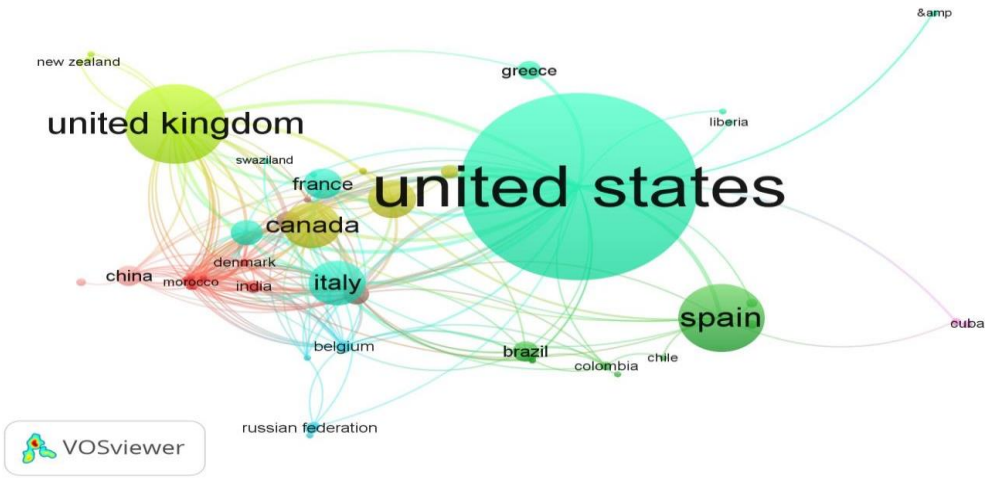


Figure 8: Visualization of active Countries network using VOSviewer usingnetwork Visualization

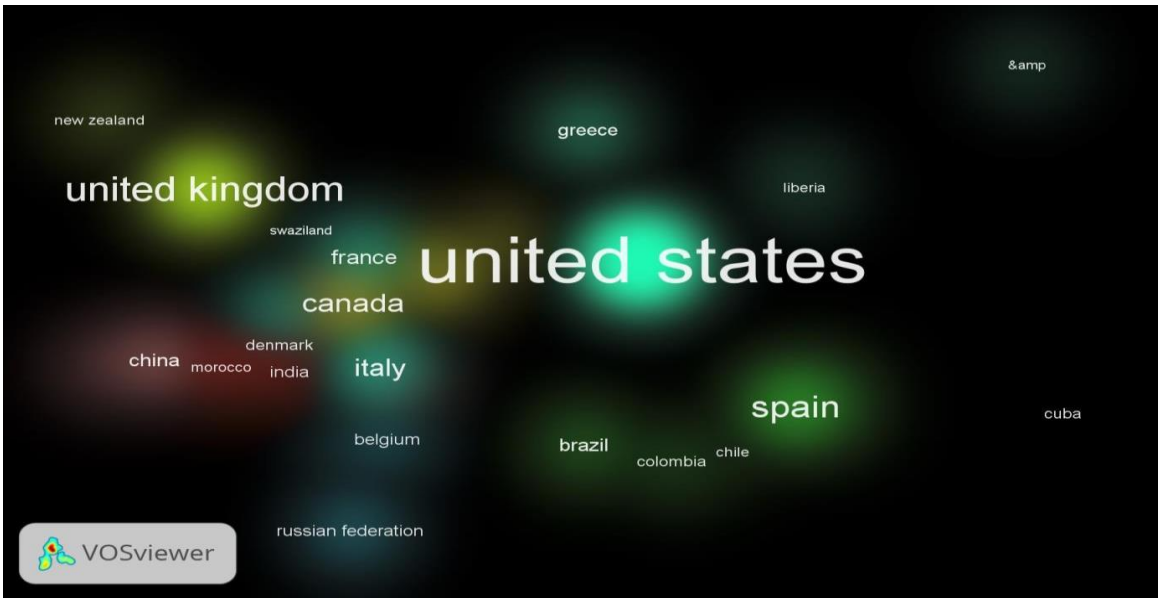


Figure 9: Visualization of active Countries network using VOSviewer usingdensity Visualization

CONCLUSION

Leadership-related studies have veered away from the norm and adopted a multidisciplinary approach. In such a framework, neuroleadership is prominently incorporated in the field of leadership research. The bibliometric analysis in conjunction with the VOSviewer approach gives a summary of where we stand in terms of comprehending the relationship between neuroleadership and leadership research. The first stage of the bibliometric analysis involved eliminating the keywords and establishing the scope of the study. It also provided information on the top nations and people who consistently achieved outcomes in studies of neuroleadership and leadership. The bibliometric analyses inevitably reveal the hidden domain of this neuroscience-neuroleadership and leadership relationship. The analysis encourages both academia and practitioners to conduct additional research into the benefits for organization. The focus of this research aimed to implement bibliometric analysis to give an in-depth analysis of neuroleadership in the field of neuroscience across time and different regions. This research explored the primary areas of neuroleadership in the literature and their contributions and it also gazed at cross-institutional, cross-national, and cross-regional collaborations over time and it presented a mapping of the field of neuroleadership by showing its present state with regard to the themes and its potential for the future. For this investigation, a total of 592 documents were retrieved from the Scopus database. This paper significantly advances the field of research in a number of important areas. The first finding from the study was that the first work on neuroscience was published in 1996, which marked the start of the discipline of neuroleadership. This finding offers researcher's crucial guidance regarding the publishing platform best suited for their research articles. According to the study, trust, empathy, and emotional intelligence are potential studies in the area of neuroleadership. The findings show that over time, the United States has produced the largest number of scientific work in the subject of neuroleadership. It indicates that the United States is still the most important nation in the area of neuroleadership. The research also shows that " Neuroeducation", "Cognition"," decision making ", Emotional intelligences ," are some of the emerging and growing concepts in the field of neuroleadership. Therefore, as recommendation for future research in the area of neuroleadership, it is suggested to build broad research collaborations across scholars and institutions which will result in a worldwide impact on neuroleadership. This will further enhance efficiency of leaders across the globe.

ORCID ID Anjali Choudhary References https://orcid.org/0000-0002-0690-3281

References

- Brown, T., Park, A. and Pitt, L. (2020), "A 60-year bibliographic review of the journal of advertising research: perspectives on trends in authorship, influences, and research impact", Journal of Advertising Research, Vol. 60 No. 4, pp. 353-360.
- Chen, C., 2006, „CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature", Journal of the Association for Information Science and Technology 57(3), 359–377. https://doi.org/10.1002/asi.20317
- Dervis_, H. (2019), "Bibliometric analysis using bibliometrix an R package", Journal of Scientometric Research, Vol. 8 No. 3, pp. 156-160.
- Diem, A. & Wolter, S.C., 2013, „The use of bibliometric to measure research performance in education sciences", Research in Higher Education 54(1), 86–114.https://doi.org/10.1007/s11162-012-9264-5
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., Lim, W.M., 2021. How to conduct a bibliometric analysis: an overview and guidelines. J. Bus. Res. 133, 285–296.

https://doi.org/10.1016/j.jbusres.2021.04.070.

- Elger, C. E. (2009). Neuroleadership. Planegg /Munchen: Haufe
- Falagas, M.E., Pitsouni, E.I., Malietzis, G.A. and Pappas, G. (2008), "Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses", The FASEB Journal, Vol. 22 No. 2, pp. 338-342.
- Gaviria-Marin, M., Merig_o, J.M. and Baier-Fuentes, H. (2019), "Knowledge management: a global examination based on bibliometric analysis", Technological Forecasting and Social Change, Vol. 140, pp. 194-220.
- Gaviria-Marin, M., Merig_o, J.M. and Baier-Fuentes, H. (2019), "Knowledge management: a global examination based on bibliometric analysis", Technological Forecasting and Social Change, Vol. 140, pp. 194-220.
- Gocen, A. (2021). Neuroleadership: A Conceptual Analysis and Educational Implications. International Journal of Education in Mathematics, Science andTechnology, 9(1), 63-82.
- Grah, B., & Dimovski, V. (2014). Neuroleadership and an Advanced Learning Organization. In E-Leader http://www. g-casa. com/conferences/milan/paper/Grah.pdf.
- Hallinger, P. and Kova_cevi_c, J. (2019), "Science mapping the knowledge base in educational leadership and management: a longitudinal bibliometric analysis, 1960 to 2018", Educational Management Administration and Leadership, Vol. 49 No. 1, pp. 5-30.
- Issac AC, Issac TG (2020) Unravelling the Nexus between neuroscience and leadership Journal of Operational Research, Vol. 246 No. 1, pp. 1-19.
- Kipper, L.M., Furstenau, L.B., Hoppe, D., Frozza, R. and Iepsen, S. (2020), "Scopus scientific mapping production in industry 4.0 (2011–2018): a bibliometric analysis", International Journal of Production Research, Vol. 58 No. 6, pp. 1605-1627.
- Kuhlmann, N., & Kadgien, C. A. (2018, May). Neuroleadership: Themes and limitations of an emerging interdisciplinary field. In Healthcare management
- forum (Vol. 31, No. 3, pp. 103-107). Sage CA: Los Angeles, CA: SAGE Publications.
- Mayr, P. & Scharnhorst, A., 2014, „Scientometrics and information retrieval: Weak- links revitalized", Scientometrics 102(3), 2193–2199. https://doi.org/10.1007/ s11192-014-1484-3
- Mingers, J. and Leydesdorff, L. (2015), "A review of theory and practice in scientometrics", European research: a biblio-morphological analysis of the extant literature. Manag Decis 58(3):448–464. https://doi.org/10.1108/MD-01-2019-0017
- Ringleb, A. H., & Rock, D. (2008). The emerging field ofNeuroLeadership. NeuroLeadership Journal, 1(1), 3-19.
- Rock, D. (2006). Quiet leadership: Six steps to transforming performance at work.Harper Collins.
- Rock, D. (2022) About Dr David Rock. Retrieved from: davidrock.net/. (Lastaccessed 15th January 2022).
- Schaufenbuel, K. (2014). The neuroscience of leadership: Practical applications. UNC Executive Development.
- Van Eck, N.J. and Waltman, L. (2014), "CitNetExplorer: a new software tool for analysing and visualizing citation networks".
- Yoon, B. and Lee, S. (2012), "Managing technological knowledge for supporting R&D activities: Scientometrics-based approach", Knowledge Management Research and Practice, Vol. 10 No. 3, pp. 237-251.