

Sustainable Leadership: A Glance from Bibliometric Analysis

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Abstract

This paper aims to conduct a bibliometric analysis for sustainable leadership. The study evaluated articles over the last two decades using performance analysis and science mapping approaches. This study evaluates 170 documents extracted from the Clarivate WOS database. The total publication (TP) was used as a performance analysis. This study performed four techniques of the science mapping approach, namely citation, co-word, co-citation, and bibliographic coupling analysis. VOSviewer, R-Studio, and Biblioshiny were used as the tools to perform the analyses. The most productive year was 2024. The most productive and influential author, institute and country is Qaisar Iqbal, University Sains Malaysia and USA respectively. Similarly, the most influential and productive journal is sustainability.

Furthermore, the most influential article is Sahlberg (2007). Hallinger & Suriyankietkaew (2018) is the most referenced article. The three and six clusters were identified through co-citation and bibliographic coupling analysis respectively. The paper also discusses the future research directions, limitations, and implications at the end of the paper.

Keywords: Sustainable leadership, Bibliometric analysis, Sustainability leadership

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1. Introduction

Forbes Sustainability Leaders 2024, highlights the top 50 superstar scientists, entrepreneurs, policymakers, funders and activists who lead the charge to face the climate crisis with real and tangible impact. The Economics Times highlights under the heading 'Decoding Sustainable Leadership', which writes about organizations requiring sustainable leadership to address global problems related to society, environment and the economy. Sustainable leadership is defined as a holistic approach to safeguarding the needs of present and future generations with respect to environmental, social and economic aspects. To know about sustainable leadership, this study explores this area through bibliometric analysis using performance analysis and a science mapping approach.

As per the Web of Science database, there is only one bibliometric study on sustainable leadership that is a very good article which is Hallinger & Suriyankietkaew (2018)⁽⁷⁾ on the Scopus database published in sustainability journal in which citation, co-occurrence and co-citation analysis were employed as an analysis technique.

This research work is different from the previous research in such a manner. First, this research work has a time period from 2004-2024. Second, this research is based on the Web of Science database. Third, this work is purely based on bibliometric analysis. Last but not least, other analysis techniques were added to this research work.

The study communicates the following research questions:

- i) What are publication trends in sustainable leadership?
- ii) What are the most impactful and productive authors, organizations and countries in sustainable leadership?
- iii) What are the most impactful and productive journals in sustainable leadership?
- iv) What are the most impactful and referenced articles in sustainable leadership?
- v) What are the past and current developments in sustainable leadership research?

- vi) What are the future trends and future research directions in sustainable leadership?

To find the solutions to these research questions, a bibliometric analysis of the publications in sustainable leadership will be performed. Citation analysis will be performed to get the most impactful and productive authors, institutions, countries and journals. This analysis will also be performed to find the most impactful articles. A co-citation analysis will be performed to get the past developments in the research area. Similarly, a bibliographic coupling will be performed to find the current developments in the research area. A co-occurrence analysis will be conducted to determine the future trends and future research directions in sustainable leadership.

This section includes the introduction which covers the research problems, objectives, gaps, questions and scope of the study. The next section discusses the research methodology. The third section is about the findings. The fourth section describes the future directions followed by the next section contains the conclusion. The sixth section describes the limitations. The seventh section presents implications of this study.

2. Research Methodology

a) Determining the Appropriate Keyword

In this paper, the primary keyword is sustainable leadership, but the second keyword is also related to the primary keyword, so the second keyword is also used for this study. The second keyword is sustainability leadership. Both keywords look similar, but the only difference is available in the first word of both keywords with respect to spelling. The maximum number of documents are covered by the primary keyword, but more than half of new articles were found by the secondary keywords. So, both keywords were used for this bibliometric analysis and are shown in stage 5 of Table 1.

Table 1:

Document Search and Inclusion Criteria

| Stage | Filtering Criteria | Exclude | Include |
|-------|---|---------|---------|
| 1 | Search Database: Clarivate Web of Science | - | - |

| | | | |
|---|---|----|-----|
| 2 | Search Date: 08 October 2024 | - | - |
| 3 | Publication Period: 2004-2024 | - | - |
| 4 | Search Fields: Topic (Title, Abstract and Author Keywords) | - | - |
| 5 | Search Term: Sustainable Leadership OR Sustainability Leadership | - | 221 |
| 6 | Document Types: Article and Review Article | 18 | 203 |
| 7 | Subject Area: Web of Science Categories – Business, Business Finance, Management, Economics, Environmental Studies, Education Educational Research, Psychology Multidisciplinary, Development Studies, Geography, Regional Urban Planning, Public Environmental Occupational Health, Education Scientific Disciplines, Law, Social Sciences Interdisciplinary, Area Studies, Ethics, Psychology Applied History, Hospitality Leisure Sport Tourism, International Relations, Political Science, and Public Administration, Health Policy Services | 32 | 171 |
| 8 | Language: English | 1 | 170 |

b) Data Collection

This study used the Clarivate WOS database which is older than the Scopus database. The data was collected on 8 October 2024 and coverage between 2004-2024. The search field is the topic which includes title, abstract, Keyword plus and author Keywords. The search term is sustainable leadership and sustainability leadership. The types of documents include articles and review articles. The subject area includes Web of Science Categories i.e. environmental Studies, management, education educational research, education scientific disciplines, business, psychology multidisciplinary, development studies, ethics, economics, regional urban planning, social sciences interdisciplinary, business finance, geography, area studies, health policy services, history, hospitality leisure sport tourism, public environmental occupational health, law, international relations, political science, psychology applied and public administration. Finally, 170 documents were extracted from the Clarivate Web of Science

database. In erroneous records screening, this article includes only those articles which have only valid author information.

c) Selecting the Techniques for Analysis

The two types of analysis techniques were employed in this bibliometric analysis which have performance analysis and science mapping approach. In performance analysis, this study shows trends in publication. In the Science mapping approach, this study presents citation, co-word, co-citation and bibliographic coupling analysis. VOSviewer was used in the science mapping approach. R-studio and Biblioshiny were used to draw results for top-referenced articles.

3. Findings

This section presents findings of the various techniques used in bibliometric analysis.

a) Performance Analysis

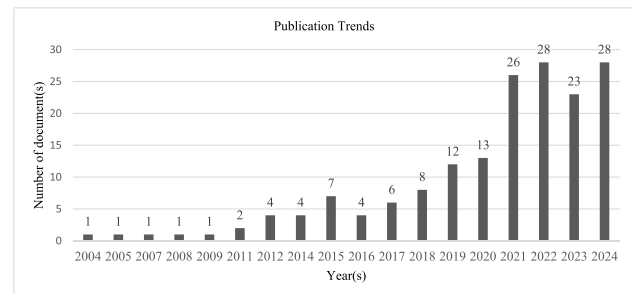


Figure 1:

Publication trend of Sustainable Leadership research

The publication trends have been shown in sustainable leadership research as per the Clarivate WOS database from 2004 to Oct 2024 in figure 1. One hundred and seventy documents were published during this period with one hundred and fifty-six articles and fourteen review articles. The total number of document(s) and year of publication are presented vertically and horizontally respectively.

Sustainable leadership is not a new domain and the first document was published in 2004. This was also the year when the Indian Ocean earthquake and tsunami occurred, one of the deadliest natural disasters in human history. The number of documents was only eleven in the first decade (2004-13). The

number of documents increased more than double from eleven to twenty-nine in the next five years (2014-18). Sustainable leadership scored a century in which the number of documents increased from twenty-nine to one hundred and two in the next five years (2019 - 2023). The year 2024 is yet to be complete; 28 documents have been already published, which is equal to the highest number of documents of the year 2022.

The field grew exponentially from 2020 onwards (e.g., more than 20 documents per year), with 2022 and 2024 being the most productive years with 28 documents. The years 2021, 2022, 2023 and 2024 have been the best. Such evidence suggests that most intellectual debates on sustainable leadership occurred following the COVID-19 pandemic. Overall, looking at the trend in recent years, the study in this area will increase in the coming years.

b) The Top Impactful and Productive Authors, Organizations and Countries in Sustainable Leadership

Table 1 presents the top impactful authors, organizations and countries through the highest citations. It also presents the top productive authors, organization and countries through the highest publications. As per Clarivate WOS database, 440 authors from 270 organizations and 61 countries published 170 documents on sustainable leadership research.

Table 1: The top ten most impactful and productive authors, organizations and countries in sustainable leadership

| TP | Author | TC | TP | Organization | TC | TP | Country | TC |
|----|-------------------------|-----|----|-------------------------|-----|----|-----------------|-----|
| 17 | Qaisar Iqbal | 432 | 11 | Univ Sains Malaysia | 322 | 29 | USA | 972 |
| 6 | Noor Hazlina Ahmad | 291 | 3 | Univ Helsinki | 284 | 9 | Canada | 495 |
| 1 | Pasi Sahlberg | 241 | 2 | Univ Toronto | 282 | 22 | Peoples R China | 480 |
| 1 | David J. Closs | 223 | 10 | Mahidol Univ | 263 | 15 | Malaysia | 444 |
| 1 | Nathan Meacham | 223 | 9 | Sichuan Univ Sci & Engn | 242 | 18 | Australia | 312 |
| 1 | Cheri Speier | 223 | 1 | World Bank | 241 | 12 | Spain | 306 |
| 4 | Suparak Suriyankietkaew | 210 | 2 | Michigan State Univ | 234 | 5 | Finland | 301 |
| 1 | D. Fink | 157 | 3 | Univ Calgary | 160 | 20 | England | 270 |
| 1 | A. Hargreaves | 157 | 1 | Boston Coll | 157 | 10 | Thailand | 263 |
| 1 | Stephanie Bertels | 138 | 1 | Simon Fraser Univ | 138 | 14 | Poland | 211 |

Note: TP = Total Production and TC = Total Citation, Authors – Citation Analysis

The minimum documents of an author and citations were taken 1 and 138 respectively, to get the top 10 authors out of 440, based on the Authors–Citation Analysis. Qaisar Iqbal, Noor Hazlina Ahmad and Pasi Sahlberg are the most impactful authors with 432, 291 and 241 citations respectively. Qaisar Iqbal, Noor Hazlina Ahmad and Suparak Suriyankietkaew are the most productive authors with 17, 6 and 4 documents respectively.

The minimum number of articles of an organization and citations were taken 1 and 138 respectively, to get the top 10 organizations out of 270, based on the Organizations - Citation Analysis. Universiti Sains Malaysia, The Helsinki University and the Toronto university are the most impactful organizations with 322, 284 and 282 citations respectively. The Universiti Sains Malaysia, Mahidol University and Sichuan University of Science and Engineering are the most productive organizations with 11, 10 and 9 documents respectively.

The minimum documents of a country and citations were taken 1 and 211 respectively, to get the top 10 countries out of 61, based on the Countries - Citation Analysis. The USA, Canada and People R China are the

most impactful countries with 972, 495 and 480 citations respectively. The USA, People R China and England are the most productive countries with 29, 22 and 20 documents respectively.

c) *The Most Impactful and Productive Journals in Sustainable Leadership*

Table 2 shows the most impactful journals with the highest citations. It also shows the most productive journals through the highest publications. As per the Clarivate WOS database, 60 journals published 170 documents on sustainable leadership research.

Table 2:

The Top Ten Most Impactful and Productive Journals on Sustainable Leadership

| Journal | ABDC | Quartile | SJR 2023 | H-Index | TP | TC | Number of Paper(s) | |
|---|------|----------|----------|---------|----|-----|--------------------|---------|
| | | | | | | | 2004-14 | 2015-24 |
| Sustainability | - | Q1 | 0.67 | 169 | 58 | 762 | - | 58 |
| International Journal of Sustainability in Higher Education | - | Q1 | 0.83 | 77 | 14 | 171 | - | 14 |
| Journal of Business Ethics | A | Q1 | 2.62 | 253 | 7 | 446 | 4 | 3 |
| Sustainable Development | - | Q1 | 2.28 | 91 | 6 | 109 | - | 6 |
| World Development | A | Q1 | 2.25 | 219 | 2 | 107 | - | 2 |
| Leadership & Organization Development Journal | B | Q1 | 1.16 | 83 | 2 | 74 | - | 2 |
| Journal of Education Policy | - | Q1 | 1.63 | 90 | 1 | 241 | 1 | - |
| Journal of the Academy of Marketing Science | A* | Q1 | 7.19 | 207 | 1 | 223 | 1 | - |
| Educational Leadership | - | - | - | 71 | 1 | 157 | 1 | - |
| Technological Forecasting and Social Change | A | Q1 | 3.12 | 179 | 1 | 98 | - | 1 |

Note: ABDC = Australian Business Deans Council, SJR = SCImago Journal Rank, TC = Total Citation and TP = Total Production

The minimum documents of a source and citations were taken 1 and 74, respectively, to get the top 10 sources out of 60, based on the Sources-Citation Analysis. Sustainability is the most influential journal with 762 citations followed by Journal of Business Ethics along with Journal of Education Policy have 446 and 241 citations, respectively. Sustainability is the most productive journal with 58 publications after that International Journal of Sustainability in Higher Education along with Journal of Business Ethics, which have 14 and 7 publications.

Journal of the Academy of Marketing Science placed in the A* category. Journal of Business Ethics, World Development along with Technological Forecasting and Social Change were ranked in the A category in the ABDC 2022 Journal Quality List. All Journals found in the Q1 rank in the journal ranking of SCOPUS except one; 9 journals are ranked in 'Q1' in the top 10 journals. Journal of the Academy of Marketing Science got 7.19 SJR (Scimago Journal Rank) scores, which is the highest, followed by Technological Forecasting and Social Change along with Journal of Business Ethics with 3.12 and 2.62 SJR scores, respectively, which are the highest in the top 10 journals.

Journal of Business Ethics, World Development and Journal of the Academy of Marketing Science are the top 3 journals with the highest H-Index values with 253, 219 and 207 respectively. The 2015-24 period is the most productive compared to the 2004-14 period which has seven documents but the previous one has 86 documents in the top 10 journals. Sustainability is the most productive journal with 58 documents published in the period 2015-24 after that International Journal of Sustainability in Higher Education, placed second with 14 documents and Sustainable Development is ranked third with six documents.

d) *The Most Impactful Articles in Sustainable Leadership Research*

Table 3:

The top ten most influential articles on sustainable leadership research

| Rank | Article | TC |
|------|---|-----|
| 1 | Sahlberg (2007) ⁽²⁵⁾ | 241 |
| 2 | Closs et al. (2011) ⁽⁴⁾ | 223 |
| 3 | Hargreaves & Fink (2004) ⁽⁹⁾ | 157 |
| 4 | Robinson et al. (2011) ⁽²⁴⁾ | 138 |
| 5 | Lourenco et al. (2014) ⁽²⁰⁾ | 125 |
| 6 | Wiengarten et al. (2017) ⁽³⁰⁾ | 101 |
| 7 | Kumar et al. (2022) ⁽¹⁸⁾ | 98 |
| 8 | Hallinger & Suriyankietkaew (2018) ⁽⁸⁾ | 97 |
| 9 | Iqbal & Ahmad (2020) ⁽¹¹⁾ | 87 |
| 10 | Park & Chung (2021) ⁽²³⁾ | 72 |

Note: TC = Total Citation

Table 3 presents the most impactful documents through the highest number of citations. This table presents 241 the highest number of citations, and 241 articles cite one article, but 170 documents are available after filtration in our dataset. How is it possible? The highest number of citations is more than the documents available in our dataset. This is possible because this analysis is based on global citations. Global citation refers to the documents in our database (Web of Science) without filtration.

Based on the Documents-Citation Analysis, the minimum citation of a document is 72 to get the top 10 documents out of 170. Sahlberg (2007)⁽²⁵⁾, Closs et al. (2011)⁽⁴⁾ and Hargreaves & Fink's (2004)⁽⁹⁾ are the most impactful articles with 241, 223 and 157 citations respectively.

e) *The most referenced articles in sustainable leadership*

Table 4:

The top ten most referenced publications in sustainable leadership

| Sr. | Article | LC | GC |
|-----|---|----|----|
| 1 | Hallinger & Suriyankietkaew (2018) ⁽⁸⁾ | 23 | 97 |
| 2 | Iqbal & Ahmad (2020) ⁽¹¹⁾ | 22 | 87 |

| | | | |
|----|--|----|-----|
| 3 | Iqbal et al. (2020) ⁽¹²⁾ | 21 | 53 |
| 4 | Suriyankietkaew & Avery (2016) ⁽²⁷⁾ | 17 | 64 |
| 5 | Iqbal et al. (2022) ⁽¹⁶⁾ | 15 | 39 |
| 6 | McCann & Sweet (2014) ⁽²¹⁾ | 13 | 36 |
| 7 | Iqbal et al. (2021a) ⁽¹³⁾ | 12 | 33 |
| 8 | Iqbal & Piwowar-Sulej (2022) ⁽¹⁶⁾ | 11 | 48 |
| 9 | Hargreaves & Fink (2004) ⁽⁹⁾ | 10 | 157 |
| 10 | Iqbal et al. (2021b) ⁽¹⁴⁾ | 10 | 60 |

Note: GC = Global Citation, LC = Local Citation

Table 4 is about the top referenced articles based on local and global citations. These results get through the R-Studio and biblioshiny. The local citation refers to getting citations from the articles available in our dataset (170 documents), and the global citation refers to getting citations from the articles available in the database (Web of Science).

Previously, Table 3 described the most impactful articles based on the documents-citation analysis, which is the same as the global citation because all articles are included and cited each other in the database. Here, the analysis is shown based on local citations.

Hallinger & Suriyankietkaew (2018)⁽⁸⁾, Iqbal & Ahmad (2020)⁽¹¹⁾ and Iqbal et al. (2020)⁽¹²⁾'s works are the most referenced article with 23, 22 and 21 local citations respectively.

f) *The Past Development of Sustainable Leadership Through Co-Citation Analysis*

Figure 2 shows the development of the foundational themes or clusters in sustainable leadership research through the cited references – co-citation analysis. A co-citation is when two articles are cited together in the reference list of another article. Co-citation was introduced by Henri Small and Irina Marshakova in 1973. A co-citation analysis shows intellectual structure, seminal publication, and knowledge foundations. In this co-citation map, out of 10735 cited references, each has at least seven citations, and 71 cited references fulfill this criterion.

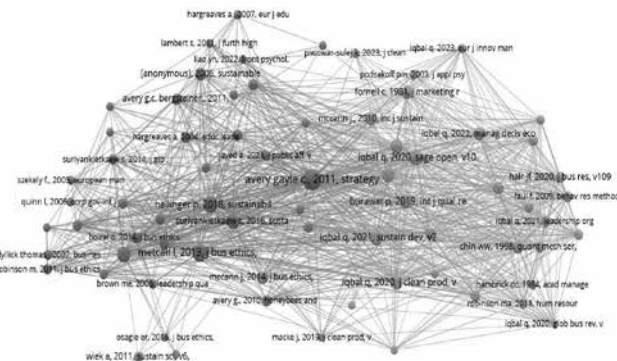


Figure 2:

Network of Cited References - Co-Citation Analysis

Table 5 exhibits three foundational themes or clusters of sustainable leadership research through co-citation (analysis type) and co-cited references (analysis unit). Sustainable Business (Red Nodes), Sustainable Leadership (Green Nodes), and Sustainable Development (Blue Nodes) are the names of foundational themes for past development of sustainable leadership research.

The size of the node indicates that a node has many connections. The links between nodes denote two or more publications that are cited together in other publications. TLS is the total of the link strengths of one node on other nodes.

Table 5:

Clusters of Sustainable Leadership Research through Co-citation analysis

| Theme | Author(s) | TC | TLS |
|-------------------------|---|----|-----|
| Sustainable Business | Avery & Bergsteiner (2011) ⁽¹⁾ | 38 | 447 |
| | Metcalf & Benn (2013) ⁽²²⁾ | 26 | 237 |
| | Hallinger & Suriyankietkaew (2018) ⁽⁸⁾ | 23 | 254 |
| Sustainable Leadership | Iqbal & Ahmad (2020) ⁽¹¹⁾ | 22 | 276 |
| | Iqbal et al. (2020) ⁽¹²⁾ | 21 | 291 |
| | Gerard et al. (2017) ⁽⁶⁾ | 20 | 273 |
| Sustainable Development | McCann & Sweet (2014) ⁽²¹⁾ | 13 | 151 |
| | Brundtland (1987) ⁽³⁾ | 11 | 69 |
| | Wiek et al. (2011) ⁽²⁹⁾ | 11 | 20 |

Note: Total Citation = TC and Total Link Strength = TLS

The first cluster (Red Cluster) consists of 33 Sustainable Business articles cited 373 times. The top three cited documents in this theme are Avery & Bergsteiner (2011)⁽¹⁾, Metcalf & Benn (2013)⁽²²⁾, and Hallinger & Suriyankietkaew (2018)⁽⁸⁾ with 38, 26, and

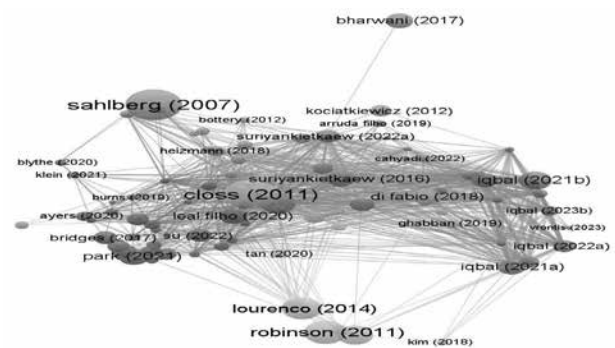
23 citations respectively. The second theme (Green Cluster) consists of 30 Sustainable Leadership articles cited 359 times. The top three cited documents in this theme are Iqbal & Ahmad (2021)⁽¹¹⁾, Iqbal et al. (2020)⁽¹²⁾ and Gerard et al. (2017)⁽⁶⁾ with 22, 21 and 20 citations respectively. The third theme (Blue Cluster) consists of 8 Sustainable Development articles cited 72 times. The top three cited documents in this theme are McCann & Sweet (2014)⁽²¹⁾, Brundtland (1987)⁽³⁾ and Wiek et al. (2011)⁽²⁹⁾ with 13, 11 and 11 citations, respectively.

g) The Current Development of Sustainable Leadership Research Through Bibliographic Coupling

Figure 3 presents the current or latest development of themes or clusters in sustainable leadership research through the documents – bibliographic coupling analysis. Bibliographic coupling means that two articles cite another article in their reference list. The bibliographic coupling also shows the recent and niche publications, the latest developments, and the present development of the research. In this bibliographic coupling map, out of 170 documents, each has at least 05 citations, and 90 documents fulfill this criterion.

Figure 3:

Documents - Bibliographic Coupling (analysis type)

**Table 6:**

Thematic clusters of sustainable leadership research

| Theme | Author(s) | TC | TLS |
|-------------------------------|--|----|-----|
| Leadership for Sustainability | Park & Chung (2021) ⁽²³⁾ | 72 | 3 |
| | Leal Filho et al. (2020) ⁽¹⁹⁾ | 59 | 75 |
| | Wang et al. (2014) ⁽²⁸⁾ | 50 | 7 |

| | | | |
|--|---|-----|-----|
| Education for Sustainable Leadership | Sahlberg (2007) ⁽²⁵⁾ | 241 | 10 |
| | Kociatkiewicz & Kostera (2012) ⁽¹⁷⁾ | 34 | 3 |
| | Heizmann & Liu (2018) ⁽¹⁰⁾ | 26 | 62 |
| Leadership for Sustainable Innovation | Iqbal & Ahmad (2020) ⁽¹¹⁾ | 87 | 226 |
| | Iqbal et al. (2021) ⁽¹⁴⁾ | 60 | 136 |
| | Iqbal et al. (2020) ⁽¹²⁾ | 53 | 208 |
| Value of Sustainable Leadership | Closs et al. (2011) ⁽⁴⁾ | 223 | 12 |
| | Robinson et al. (2011) ⁽²⁴⁾ | 138 | 7 |
| | Lourenço et al. (2014) ⁽²⁰⁾ | 125 | 34 |
| Competencies of Sustainable Leadership | Hallinger & Suriyankietkaew (2018) ⁽⁸⁾ | 97 | 195 |
| | Suriyankietkaew & Avery (2016) ⁽²⁷⁾ | 64 | 84 |
| | Bharwani & Talib (2017) ⁽²⁾ | 58 | 1 |
| Sustainable Human Development | Di Fabio & Peiró (2018) ⁽⁵⁾ | 63 | 26 |
| | Santana & Lopez-Cabrales (2019) ⁽²⁶⁾ | 33 | 54 |
| | Ghabban et al. (2019) ⁽⁷⁾ | 21 | 3 |

Note: Total Citation = TC and Total Link Strength = TLS

Table 6 presents the six thematic clusters of sustainable leadership research through the documents - bibliographic coupling analysis. Leadership for sustainability (Red Nodes), Education for Sustainable Leadership (Green Nodes), Leadership for Sustainable Innovation (Blue Nodes), Value of Sustainable Leadership (Orange Nodes), Competencies of Sustainable Leadership (Purple Nodes) and Sustainable Human Development (Light Blue Nodes) are the names of themes for the present development of sustainable leadership research. The size of the node indicates the citations for the document. The links between nodes indicate the number of references shared. TLS is the sum of the link strength of two documents that cite one document.

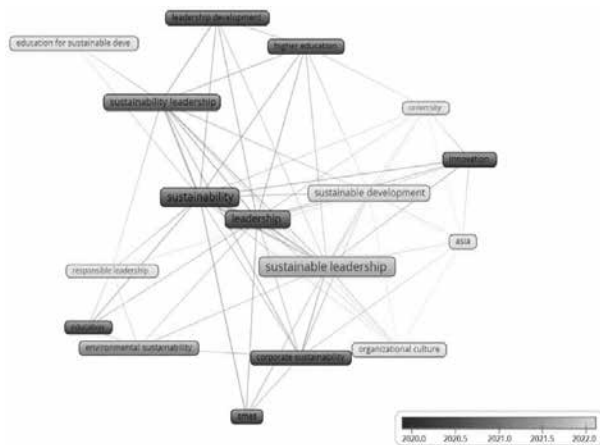
The first cluster or theme (Red) consists of 30 articles on Leadership for Sustainability which have been cited 676 times. The top three cited documents in this theme are Park & Chung (2021)⁽²³⁾, Leal et al. (2020)⁽¹⁹⁾ and Wang et al. (2014)⁽²⁸⁾ with 72, 59 and 50 citations, respectively. The second cluster or theme (Green) consists of 15 Education for Sustainable Leadership articles cited 469 times. The top three cited documents in this theme are Sahlberg (2007)⁽²⁵⁾, Kociatkiewicz & Kostera (2012)⁽¹⁷⁾ and Heizmann & Liu (2018)⁽¹⁰⁾,

with 241, 34, and 26 citations, respectively. The third cluster or theme (Blue) consists of 15 Education for Sustainable Leadership articles cited 446 times. The top three cited documents in this theme are Iqbal & Ahmad (2020)⁽¹¹⁾, Iqbal et al. (2021)⁽¹⁴⁾ and Iqbal et al. (2020)⁽¹²⁾ with 87, 60, and 53 citations respectively. The fourth cluster or theme (Orange) consists of 11 articles on the Value of Sustainable Leadership which have been cited 737 times. The top three cited documents in this theme are Closs et al. (2011)⁽⁴⁾, Robinson et al. (2011)⁽²⁴⁾ and Lourenço et al. (2014)⁽²⁰⁾ with 223, 138 and 125 citations, respectively. The fifth theme (Purple) consists of 10 articles on Competencies of Sustainable Leadership which have been cited 337 times. The top three cited documents in this theme are Hallinger & Suriyankietkaew (2018)⁽⁸⁾, Suriyankietkaew & Avery (2016)⁽²⁷⁾, and Bharwani & Talib (2017)⁽²⁾, with 97, 64, and 58 citations, respectively. The sixth theme (Light Blue) consists of 9 Sustainable Human Development articles cited 199 times. The top three cited documents in this theme are Di Fabio & Peiró (2018)⁽⁵⁾, Santana & Lopez-Cabrales (2019)⁽²⁶⁾ and Ghabban et al. (2019)⁽⁷⁾ with 63, 33 and 21 citations respectively.

h) The Future Trends of Sustainable Leadership Research Through Co-Word Analysis

Figure 4 shows the prediction of sustainable leadership research through the co-occurrence analysis. It is also known as Co-word analysis because two keywords come together in an article. Co-occurrence was introduced by Callon et al. in 1991. The minimum frequencies of a keyword out of 630 are 4 in the 170 articles based on the author keywords co-occurrence analysis.

Figure 4 shows an overlay visualization of the author's keywords. This network suggests keyword trends over a year. Organizational Culture, Responsible Leadership, Education for Sustainable Development and Sustainable Development are the most recent keywords used in this sustainable leadership research followed by Sustainable Leadership, Environmental Sustainability and Sustainability Leadership.

Figure 4:*Author keywords – co-word Analysis***Table 7:***List of author keywords in sustainable leadership through co-occurrence analysis*

| Keyword | Occurrences | Total link strength |
|---------------------------------------|-------------|---------------------|
| Sustainable Leadership | 57 | 55 |
| Sustainability | 38 | 53 |
| Leadership | 28 | 40 |
| Sustainable Development | 24 | 33 |
| Sustainability Leadership | 22 | 31 |
| Corporate Sustainability | 8 | 16 |
| Asia | 5 | 12 |
| Organizational Culture | 5 | 12 |
| Higher Education | 8 | 11 |
| Leadership Development | 7 | 9 |
| Responsible Leadership | 4 | 9 |
| University | 4 | 9 |
| Innovation | 5 | 8 |
| Smes | 5 | 8 |
| Environmental Sustainability | 6 | 6 |
| Education | 4 | 5 |
| Education for Sustainable Development | 5 | 3 |

Note: Total Link Strength = TLS

As a result, future researchers can use these keywords in their future studies. Most importantly, it determines that Sustainable Development, Organizational Culture, Responsible Leadership and Education for Sustainable Development are the most recent research topics investigated.

Table 7 presents the author's keywords, representing sustainable leadership research's most frequently used words. The term Sustainable Leadership holds first rank with 57 frequencies after that Sustainability (38). It shows that most previous studies on the author's keywords which are sustainable leadership, sustainability and leadership. These have been mentioned in sustainable leadership research. Table 7 also presents the link strength between keywords, indicating that Sustainable Leadership, Sustainability, Leadership, Sustainable Development, and Sustainability Leadership have strong network links. This implies that these five keywords had been regularly used in research over the last 20 years.

4. Future Research Directions

Evaluating sustainable leadership research in social science from a past context is significant for deciding present and future results. By investigating related papers, this study may set up a baseline for the fast-growing domain of sustainable leadership research in social science, allowing future researchers to investigate the usage and benefits of sustainable leadership in the social science area.

A future study could see how the most sustainable leadership practices to perform better in the organizations. Between 2004 and 2014, the studies focused on leadership, sustainability, sustainable leadership and sustainability leadership. The studies from 2015 to 2024 concentrated on sustainable leadership, sustainability, sustainable development, leadership, sustainability leadership, and corporate sustainability. Sustainability is noteworthy as a sustainable leadership research for sustainable development and leadership.

The practice of sustainability in sustainable leadership research is a running topic in current studies. Sustainability works in several forms, such as, economic sustainability, social sustainability, environmental sustainability, corporate sustainability, business sustainability and education sustainability. Future studies on sustainability and leadership themes shall work towards leadership for sustainability. Furthermore, future studies shall be on leadership development for sustainability etc. Furthermore, future research directions for sustainability leadership and education for sustainable development should

also use sustainability. The studies on sustainable development are numerous. However, the studies focused on sustainable leadership are titular. So, research on this area in the future will change the fortune of organizations and permit them to enforce sustainable leadership to encourage their business.

Further, future studies on the corporate sustainability theme shall be given attention to the process of corporate social responsibility activities in business. Specifically, social responsibility, responsibility towards the environment, sustainable business, social welfare, and employment for the community apply to business. Further, future studies could be on the utilization and benefits of corporate sustainability for consumer co-creation and community involvement. Future studies on the execution of corporate sustainability for customer's response and reactions and the application of sustainability promote the products and services provided by businesses. Future study could be conducted on the applications of social welfare, employee welfare, ethics, and sustainable business in terms of corporate sustainability. Future study could be organized on business culture and the competitive advantage of corporate sustainability for business.

Besides, future studies for innovation and sustainable development could focus on sustainable innovation, challenges of frugal innovation adoption, and organizational innovation climate to understand consumers' needs and behavior for social innovation exercises. Additionally, future studies could focus on the environmental innovation strategy, resource constraint innovation, and disruptive innovation aspects of organizations in adopting and implementing sustainable leadership in their businesses. Further, future studies on responsible leadership themes could be conducted, concentrating on environmental sustainability, environmental leadership, social environmental system, environmental identity, and environmental psychological ownership.

5. Conclusion

This research contributes in many ways to the area of sustainable leadership research. First, this study presents the publication trends in sustainable leadership research by year-wise publication, the most productive year, and the growth of sustainable

leadership research. Second, through citation analysis, this study shows the most impactful and productive authors, institutes, and organizations based on the publications and the number of citations. Third, this study explores the most impactful and productive journals based on citations and publications through citation analysis; it also finds ABDC and Scopus rank, SJR and H-Index scores, and articles decade-wise. Fourth, this study presents the most impactful articles based on the frequency of citations through citation analysis in sustainable leadership research. Fifth, this study presents the most reference documents based on the local and global citations through R-Studio and biblioshiny in sustainable leadership research. Sixth, this study offers the past development or foundational themes/ clusters of sustainable leadership research through co-citation analysis. Seventh, this study exhibits the current development/thematic cluster of sustainable leadership research through bibliographic coupling analysis. Finally, this study explores the future trends and directions of sustainable leadership research through co-occurrence analysis.

6. Limitations

This research work also has limitations, just like any other research work. First, this study only looked at the bibliographies of articles published in the WOS database. Second, different analysis techniques will be used in future studies, along with other statistical tools like Gephi, BibExcel, etc.

7. Implications

This research has a variety of implications for scholars, academicians, policy-makers, practitioners, managers, entrepreneurs and marketers. Further, it could also help them to see the gap in the current literature and future directions, which will help them to conduct future studies. They should be aware of the existing research in this domain. By getting the impactful and vital contributors of the research and the cause for becoming prominent contributors, they can use these documents to answer the existing educational and industrial problems.

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