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A Bibliometric Study of Soft Systems Methodology, 2001 – 2021

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Abstract

The main objective of this study is to conduct a bibliometric study of soft systems methodology for community research analysis of twenty years (2001 – 2021) of trends in Soft Systems Methodology for community research topics. The literature was extracted and analyzed using the Web of Science database. VOSViewer software was used to identify and visualize key trends, influential authors, and journals. The 157 filtered documents were selected based on three main criteria which are (i) Topics on Soft Systems Methodology or Soft System Methodology and community, (ii) Type of documents on 'Article', and (iii) Year Published within 2001 to 2021. We conducted several types of analyses on the body of research using VOSViewer which are (i) Co-authorship analysis, (ii) Co-occurrence analysis, (iii) Citation analysis, and (iv) Co-citation analysis. The main contribution and motivation for this study are in the form of a conceptual framework of Soft Systems Methodology for community research topics in guiding future research and projects in supporting relevant five UN Sustainable Development Goals agenda on (i) 'Quality Education', (ii) 'Sustainable Cities and Communities', (iii) 'No poverty', (iv) 'Good Health and Well-Being and (v) 'Zero Hunger'. There are five major keyword clusters concerning Soft Systems Methodology and community research (2001 – 2021), that we had determined based on the theme clusters which are (i) 'Methodology' oriented-keywords, (ii) 'Community' oriented-keywords, (iii) 'Future' oriented-keywords, (iv) 'sustainable development' oriented-keywords on, and (v) 'Systems' oriented-keywords themes.

Keywords Soft Systems Methodology, Community, Sustainable Development Goals, Information Technology

Introduction

There are ongoing trends in Soft Systems Methodology for community research (Wilson & Haperen, 2015; Checkland & Poulter, 2020) in guiding future research and projects in supporting the UN Sustainable Development Goals agenda. Because academic literature on Soft Systems Methodology for community research topics is dispersed across domains, a full literature mapping is required. Specifically, we seek answers to the following questions:

- Over the last two decades (2001-2021), how has the amount of study been on Soft Systems Methodology for community research?
- What are the key terms associated with the Soft Systems Methodology for community research in the literature (2001-2021)?
- Who are the most prolific researchers and what links do they have to each other in Soft Systems Methodology for community research literature (2001-2021)?
- Which journals and countries are the most prominent and influential in their publication of Soft Systems Methodology for community research literature (2001-2021)?
- What is the conceptual framework of Soft Systems Methodology for community research topics in guiding future research and projects?

Methods

The main objective of this study is to conduct a bibliometric study of soft systems methodology for community research analysis of twenty years (2001 – 2021) of trends in Soft Systems Methodology for community research topics. A similar method was conducted on the scientometric analysis of twenty years of trends in mobile learning, blended learning, online learning, e-learning, and dental education research (Isa & Amin, 2022). The literature was extracted and analyzed using the Web of Science database. VOSViewer software was used to identify and visualize key trends, influential authors, and journals. The 157 filtered documents were selected based on three main criteria which are (i) Topics on Soft Systems Methodology or Soft System Methodology and community, (ii) Type of documents on 'Article', and (iii) Year Published within 2001 to 2021. We conducted several types of analyses on the body of research using VOSViewer which are (i) Co-authorship analysis, (ii) Co-occurrence analysis, (iii) Citation analysis, and (iv) Co-citation analysis. The results are presented in the next section.

Results and Discussions

Fig. 1 shows the number of documents features' search terms – Soft Systems Methodology or Soft System Methodology and community (2001-2021). The following discusses the results and discussion for (i) 'Co-authorship analysis', (ii) 'Co-occurrence analysis', (iii) 'Citation analysis', and (iv) 'Co-citation analysis'. A conceptual framework was also being developed.

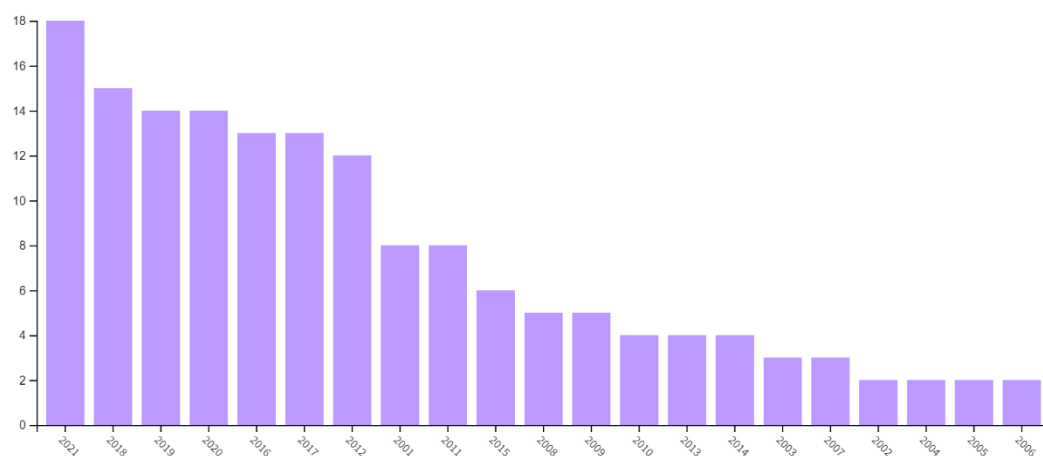


Fig. 1. The number of documents features search terms – Soft Systems Methodology or Soft System Methodology and community (2001-2021).

Co-authorship Analysis

In general, 'co-authorship analysis can be described as the greater the number of co-authored papers, the higher the relatedness of authors, institutions, and countries' (Van Eck & Waltman, 2010; Park et al., 2020). In total, 545 authors were involved in writing the 157 articles that comprised the Web of Science results related to the Soft Systems Methodology for community research topics from the year 2001 to 2021. By using VOSviewer, the minimum number of documents published by an author was set to two and the minimum number of citations of an author to zero. 8 authors met this threshold. Subsequently, the result of co-authorship analysis is shown in **Fig. 2** which includes 7 clusters. The first cluster (red node) comprises Chang, N.B. and Chen, W.C. The second cluster (green node) comprises Bogue, Robert. The third cluster (dark blue node) comprises Grunden, Kerstin. The fourth cluster (yellow node) comprises Ison, Ray. The fifth cluster comprises of Paucar-Caceres, Alberto. The sixth cluster (bright blue node) comprises Price, Morgan. The seventh cluster (orange node) comprise White, Leroy.



Fig. 2. Co-authorship diagram (Generated by VOSviewer)

The top six countries in terms of the number of papers published are listed in **Table 1**.

Table 1. The top ten countries in terms of the number of papers published

Country	Documents	Citations
England	38	550
Australia	14	193
New Zealand	6	63
USA	27	479
Brazil	7	21
Canada	6	134
Netherlands	6	54
Spain	5	167
Switzerland	8	679
Colombia	5	27
Sweden	7	71
India	6	26

By using VOSviewer, the threshold for analysis was set for five documents published per country with 0 citations. As a result, 12 of the 60 countries in our data met this criterion. These clusters, when analyzed further, comprise five networks (clusters) of countries that work together, as shown in **Fig. 3**. The first cluster (in red node) comprises Brazil, England, and India. The second cluster (green node) comprises the Netherlands, New Zealand, and the USA. The third cluster (in blue node) comprises Canada and Spain. The fourth cluster (yellow node) comprises Australia and Sweden. The fifth cluster (purple node) comprises Colombia and Switzerland.

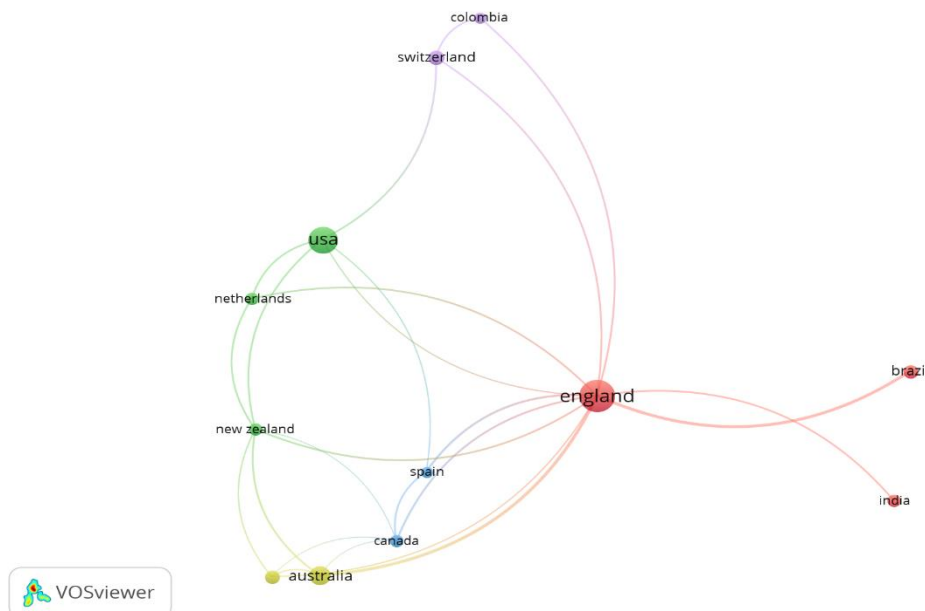


Fig. 3. Co-authoring countries are shown on the mapping (Generated by VOSviewer)

Co-occurrence Analysis

In general, 'the bigger the number of papers in which two keywords appear together, the higher the relatedness of these keywords, according to co-occurrence analysis' (Van Eck & Waltman, 2010; Park et al., 2020). VOSViewer collects 'co-occurrences of both author keywords and all other keywords, demonstrating their frequency and relatedness' (Van Eck & Waltman, 2010; Park et al., 2020). Co-occurrence analysis includes 'measuring the number of documents in which two terms or words are found together' (Van Eck & Waltman, 2010; Park et al., 2020). VOSViewer was set for a threshold of five documents in which a keyword had to appear for it to be included. Out of 1055 keywords, the data subsequently resulted in 23 keywords with accord to the aforementioned threshold. Table 2 lists the ten most commonly occurring keywords that appeared in our sample of 157 papers. The top five most commonly occurring keywords are 'Soft Systems Methodology', 'Management', 'Problem Structuring Methods', 'Systems Thinking', and 'Systems'.

There are five major keyword clusters concerning Soft Systems Methodology and community research (2001 – 2021), that we had determined based on the theme clusters which are (i) 'Methodology' oriented-keywords, (ii) 'Community' oriented-keywords, (iii) 'Future' oriented-keywords, (iv) 'sustainable development' oriented-keywords and (v) 'Systems' oriented-keywords themes. Fig. 4 shows the mapping of the keyword co-occurrences and also depicts the dominant links between keywords and clusters. First, the shown in red that we classify as 'Methodology' oriented-keywords comprises 'design', 'framework', 'intervention', 'methodology', 'multimethodology', 'participation', 'systems thinking'.

Second, the keywords that are shown in green that we classified as 'community' oriented-keywords comprises 'communication', 'communities', 'health-care', 'management', 'model', 'soft systems methodology' and 'system'. Third, the terms, that are shown in blue that we classified as 'future' oriented-keywords comprises 'future', 'problem structuring method', and 'soft'. Fourth, the terms that are shown in yellow that we classified as 'sustainable development' oriented-keywords are 'community operational research', 'soft systems', and 'sustainable development'. Fifth, the terms that are shown in purple that we classified as 'Systems' oriented-keywords are 'community', 'sustainability', and 'systems'.

Table 2. Most Commonly Occurring Keywords

Keyword	Number of Occurrences
Soft Systems Methodology	32
Management	19
Problem Structuring Methods	12
Systems Thinking	10
Systems	10
Future	10
Community	9
Design	8
Participation	7
Framework	7
Health-care	6
Multimethodology	5
Soft	5
Communities	7
Model	6
Sustainability	7
Communication	5
Intervention	5
Methodology	5

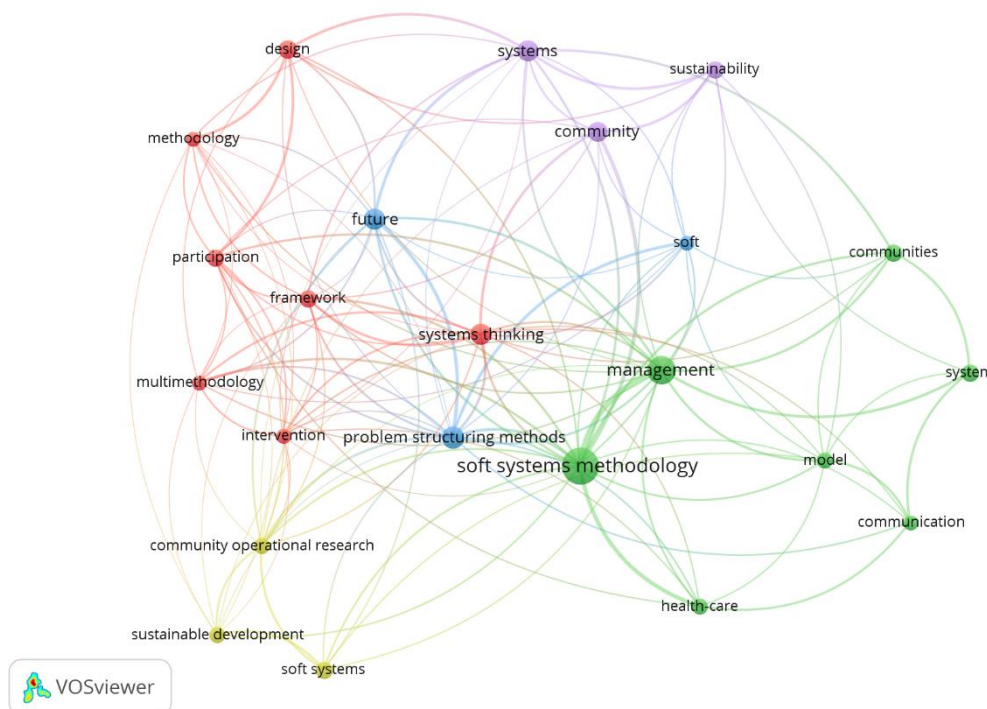


Fig. 4. Keyword co-occurrences are shown on the mapping (Created by VOSviewer)

Citation Analysis

In general, ‘the more the number of times authors, journals, and publications cite each other, the more connected these items are, according to citation analysis’ (Van Eck &

Waltman, 2010; Park et al., 2020). Citation analysis is ‘based on the relatedness of entities like authors and journals, which is determined by how many times they cite each other’(Van Eck & Waltman, 2010; Park et al., 2020). Which documents in the field of Soft Systems Methodology for community research topics cite each other? We use VOSviewer and set the threshold that a paper is cited at least thirty times. Out of 157 documents, only 19 documents met this threshold which created 17 clusters as shown in Fig. 5.

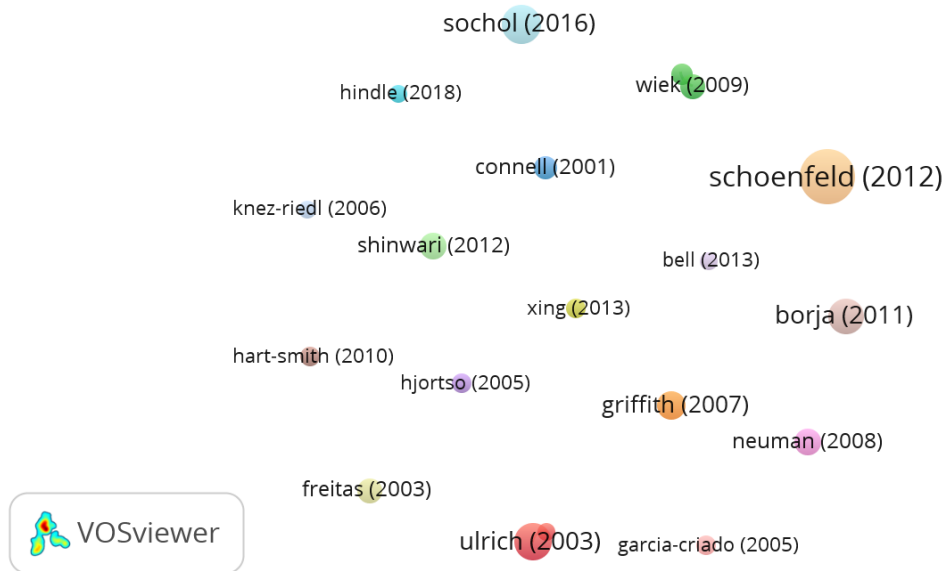


Fig. 5. Citations by paper are shown on the mapping (Created by VOSviewer)

The threshold was set in VOSviewer that a journal had to be cited at least five times to be included in the map and the minimum number of a document of a source is three. Three journals out of 119 sources met this criterion and of these and created four main clusters as shown in Fig. 6. First, the cluster comprises of ‘European Journal of Operation Research’ and ‘Journal of the Operational Research Society’. Second, the cluster comprises ‘Systemic Practice and Action Research’.



Fig. 6. Citations by the journal are shown on the mapping (Created by VOSviewer)

Co-citation Analysis

In general, ‘the greater the number of times authors, journals, and publications are referenced together, the stronger the relatedness of these items, according to the co-citation

analysis' (Van Eck & Waltman, 2010; Park et al., 2020). Co-citation analysis looks at 'how closely elements like authors, journals, and publications are mentioned together and how it has shaped academic discussions in the subject' (Van Eck & Waltman, 2010; Park et al., 2020).

The co-citation analysis was done on all authors cited in the 157 papers. A threshold of 70 citations per author was set in the VOSviewer. Thus, this subsequently filtered the data to only four authors to be analyzed for the co-citation network map analysis. The top four most-cited authors were Jackson, M .C. (101 citations), Mingers, J. (71 citations), Checkland, P. (118 citations), and Midgley, G. (97 citations) as shown in Fig. 7.

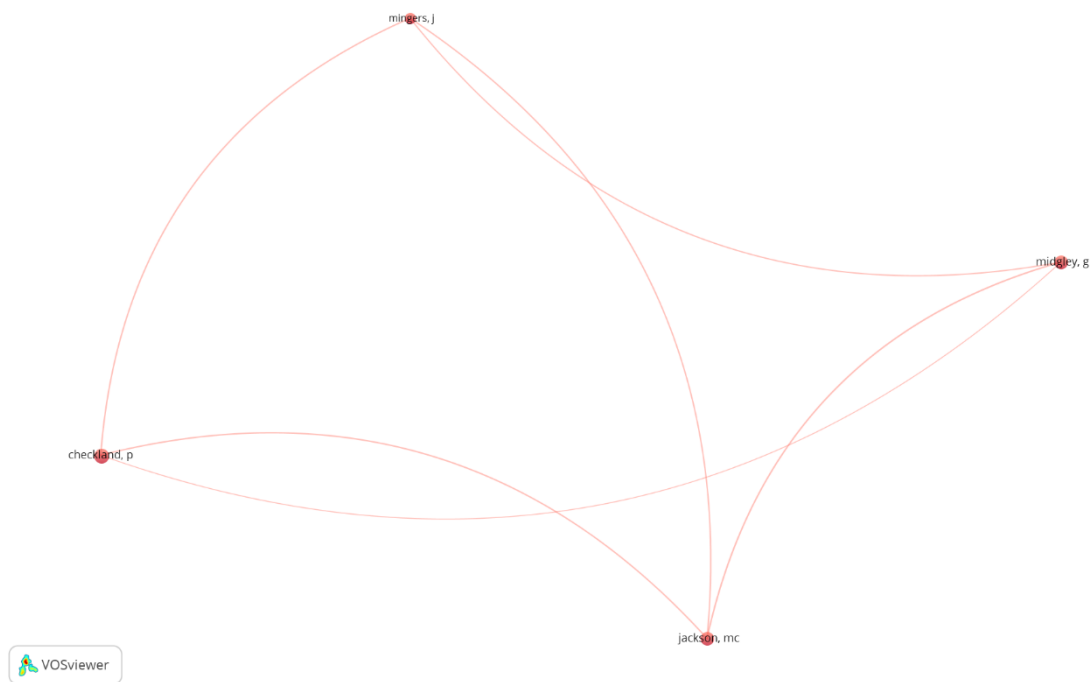


Fig. 7. Co-citations by the author are shown on the mapping (Created by VOSviewer)

Conceptual Framework

'Methodology' oriented-keywords	'design', 'framework', 'intervention', 'methodology', 'multimethodology', 'participation', 'systems thinking'
'Community' oriented-keywords	'communication', 'communities', 'health-care', 'management', 'model', 'soft systems methodology', 'system'
'Future' oriented-keywords	'future', 'problem structuring method', 'soft'
'sustainable development' oriented-keywords	'community operational research', 'soft systems' and 'sustainable development'.
'Systems' oriented-keywords	'community', sustainability', 'systems'

Fig. 8. A conceptual framework for Soft Systems Methodology for community research topics

Based on the bibliometric study of Soft Systems Methodology for community research topics (2001 – 2021), we propose a conceptual framework of Soft Systems Methodology for community research topics (see Fig. 8) to guide future research and projects. VOSviewer was set for a threshold of five documents in which a keyword had to appear for it to be included. Out of 1055 keywords, the data subsequently resulted in 23 keywords with accord to the aforementioned threshold. Table 2 lists the ten most commonly occurring keywords that appeared in our sample of 157 papers. The top five most commonly occurring keywords are 'Soft Systems Methodology', 'Management', 'Problem Structuring Methods', 'Systems Thinking', and 'Systems'.

There are five major keyword clusters concerning Soft Systems Methodology for community research topics (2001 – 2021), that we had determined based on the theme clusters which are (i) 'Methodology' oriented-keywords, (ii) 'Community' oriented-keywords, (iii) 'Future' oriented-keywords, (iv) 'sustainable development' oriented keywords on, and (v) 'Systems' oriented-keywords themes. Fig. 4 shows the mapping of the keyword co-occurrences and also depicts the dominant links between keywords and clusters. First, the shown in red that we classify as 'Methodology' oriented-keywords comprises 'design', 'framework', 'intervention', 'methodology', 'multimethodology', 'participation', and 'systems thinking'.

Second, the keywords that are shown in green that we classified as 'community' oriented-keywords comprises 'communication', 'communities', 'health-care', 'management', 'model', 'soft systems methodology', and 'system'. Third, the terms, that are shown in blue that we classified as 'future' oriented-keywords comprises 'future', 'problem structuring method', and 'soft'. Fourth, the terms that are shown in yellow that we classified as 'sustainable development' oriented-keywords are 'community operational research', 'soft systems', and 'sustainable development'. Fifth, the terms that are shown in purple that we classified as 'Systems' oriented-keywords are 'community', sustainability', and 'systems'. The

theme and sub-themes as shown in Fig. 8 are important to be referred to for future possible research in Soft Systems Methodology for community research topics research topics

Conclusion

The theme and sub-themes as shown in Fig. 8 are important to be referred to for future possible research in Soft Systems Methodology for community research topics. The main contribution and motivation for this study are in the form of a conceptual framework of Soft Systems Methodology for community research topics in guiding future research and projects in supporting relevant five UN Sustainable Development Goals agenda on (i) 'Quality Education', (ii) 'Sustainable Cities and Communities, (iii) 'No poverty', (iv) 'Good Health and Well-Being and (v) 'Zero Hunger'. Example of possible tangible outcomes of Soft Systems Methodology for community projects such as (i) Traditional Medicinal Plant Database Research that supports UN Sustainable Development Goals agenda on 'Good Health and Well-Being' and (ii) Mobile Learning for Dental Health Education for Rural Communities that support UN Sustainable Development Goals agenda on 'Quality Education'. These are a few examples of many tangible outcomes deemed possible to support the UN Sustainable Development Goals agenda and become a practical contribution to the community.

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