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A BIBLIOMETRIC ANALYSIS OF STUDENT PERFORMANCE IN HIGHER EDUCATION USING VOS VIEWER

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ABSTRACT

Over the last 60 years, higher education has gained increasing attention from researchers, learners, as well as educational institutions around the world. This study focuses on the review of quality of higher education by analysing the literature using bibliometric analysis with VOS viewer software. It examines data from 2,500 studies published in various journals and conferences worldwide between 1964 and 2024 related to this topic.

It is identified that bibliometric analysis plays a key role in outlining the academic writings and creating a combined academic structure on the quality of higher education. For the new researchers those who are new to this multidisciplinary topic this paper provides significant points of reference.

Keywords: *Student's academic performance, Higher Education, Bibliometric Analysis Dimension database, VOS Viewer, Network map, Density map*

I. INTRODUCTION

Computer programs are used to help and manage huge amounts of data by organizing, storing, publishing, distributing, and handling various studies. Software like Cite space and VOS viewer assist in identifying the most influential researchers globally. As a result, diverse sources, keywords, cases, and organizations should be identified in the research paper.

This research paper explores bibliometric analysis and highlights its significance as compared to earlier practices like meta-analysis and systematic review, specifically with respect to the quality of higher education. This paper, therefore, examines academic performance and the scientific output of higher education as indexed in the Dimension Database. The primary objective is to analyse the trends in higher education as presented in literature and to determine the key sources, authors, organizations and countries that contribute the most significant outcomes on this topic.

II. LITERATURE SURVEY

Education makes people more responsible, well-informed global citizens [1]. Researchers have noted that graduate employability still remains an important issue for most higher education institutions [5][6][7]. Job readiness of a graduate learner is based on higher education taken by the student for his professional growth and employability skills [8][9][10]. Since the mid 2010 the investigation in students' achievements have increased. It emphasises on student retention and engagement in western countries [12]. From 2015 to 2019 it has been identified that the number of publications on student performance have significantly increased. the contributions are mainly from countries like china, India and united states. [13] After the COVID19 pandemic hit the research directions were changed towards the academic performance and parental educational background. [14]

III. RESEARCH METHODS

3.1 Data Mining and Search Strategy

Data Mining was conducted on 10th September 2024 on the database of Dimension.ai. Dimensions.ai is a comprehensive research database and analytics platform that provides access to a vast collection of scholarly information, including research articles, patents, clinical trials, datasets, and policy documents, developed by Digital Science. Dimensions database aims to offer a more integrated and detailed view of the research ideas by linking different types of content, enabling users to explore connections between various data points. In this research paper the title and abstracts of the journals, keywords include "academic performance" AND "higher education". The earliest date of publication of papers similar to this research was in 1964, and the latest date was set to 2024. Using the query strings TITLE-ABS-KEY ("student placement prediction") AND ("machine learning")("campus placement"), there were 11 documents retrieved from the search. The second search query using query strings (“student placement prediction”) AND (“machine learning”) yielded 25 documents. The third search query using strings (“student academic performance”) AND (“ higher education ”) yielded 769 documents. Finally the fourth search query using query strings (“student placement prediction”) AND (“ higher education ”) yielded 2500 documents. Figure 1 depicts the flowchart of the data retrieval process from the dimension’s database.

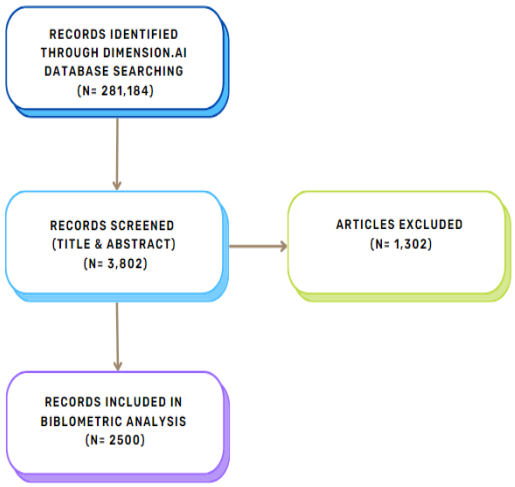

Figure 1: Flowchart of data retrieval of academic performance and higher education publications in dimension database.

3.2 Bibliometric Maps

Version 1.6.19 of VOS viewer was used to perform the bibliometric analysis, so that the data of citations, bibliographic mapping, co-citation, and co-authorship networks were obtained. VOS viewer is a tool designed to create and display maps of bibliometric. It means a detailed analysis of diverse items within a dataset can be used. The software application mapped the countries and author keywords. Any positive number in visualizations represents the strength in the link within 2 keywords or any set of keywords that appear together known as co-occurrence. This also applies in network visualization where colours, size of the circle, and connecting lines thickness represents different parameters. The intensity of association between countries can be presented by a number of articles, co-authored by researchers from various nationalities.

Even at the level of co-occurrence analysis, the comparative strength of the link between the author keywords it connects is represented by the number of times two keywords appear together.

1) Co-authorship and Organizations

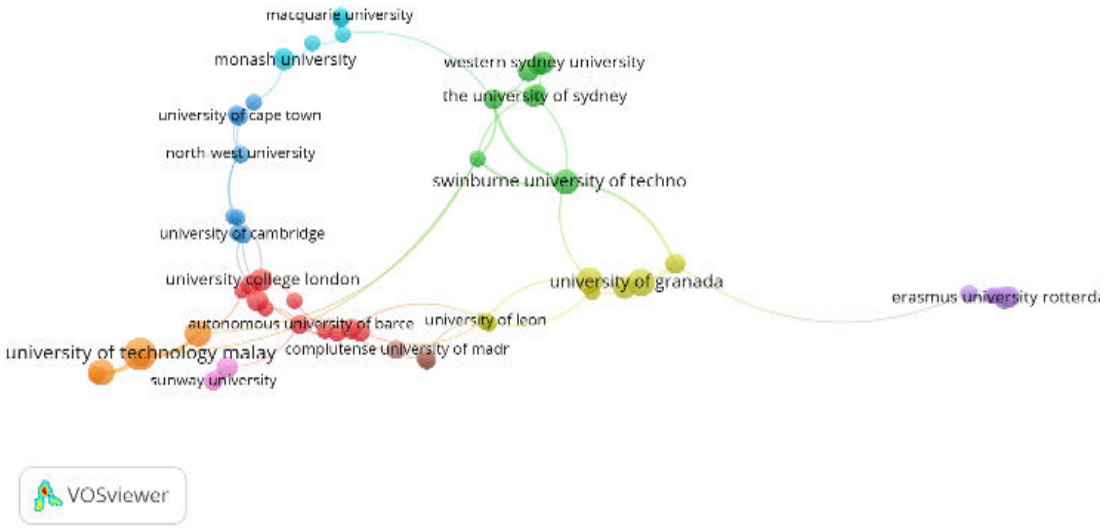

Figure 2: Network Map of co-authorship & Organizations

In the network map in figure 2, the analysis of co-authors and organizations has appeared. Of the total number of 2074 organizations, only 96 met the criteria, which stipulated at least 5 documents and 3 or more citations for an organization. from the above data it was found that only 58 items were connected to each other which formed the largest group whereas 96 items were not connected to each other in the network [11]. It made 9 groups of 58 items with 84 internal connections, and the total strength of the links is 111.Figure 3 represents the density map

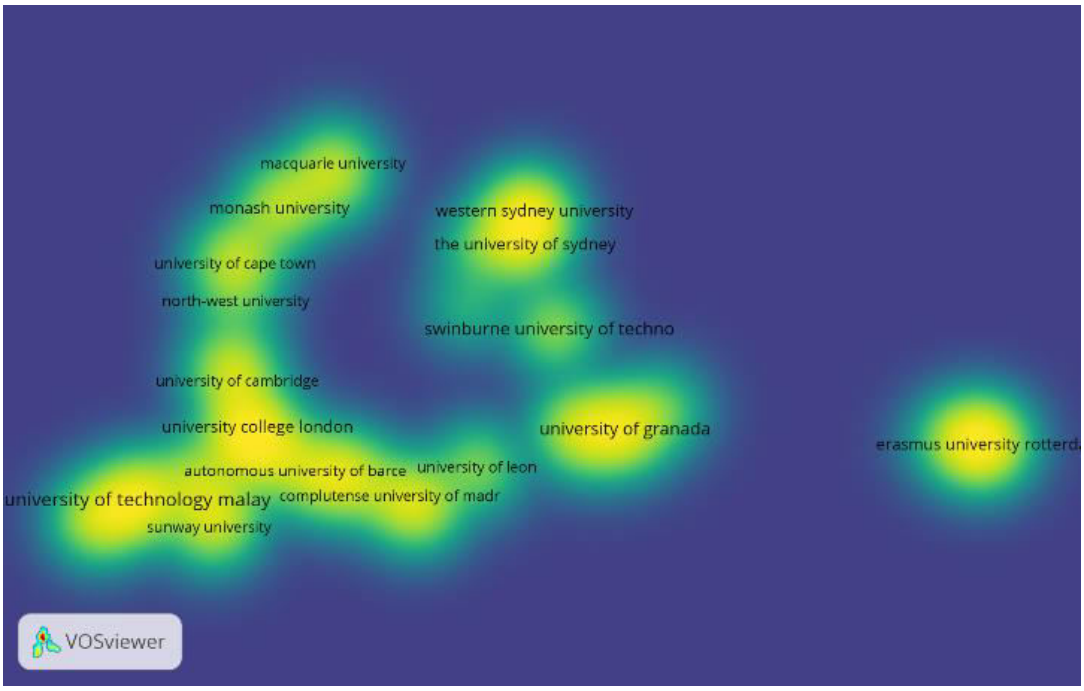

Figure 3: Density map of Co-Authorship and Organizations

2) Co-authorship and Countries

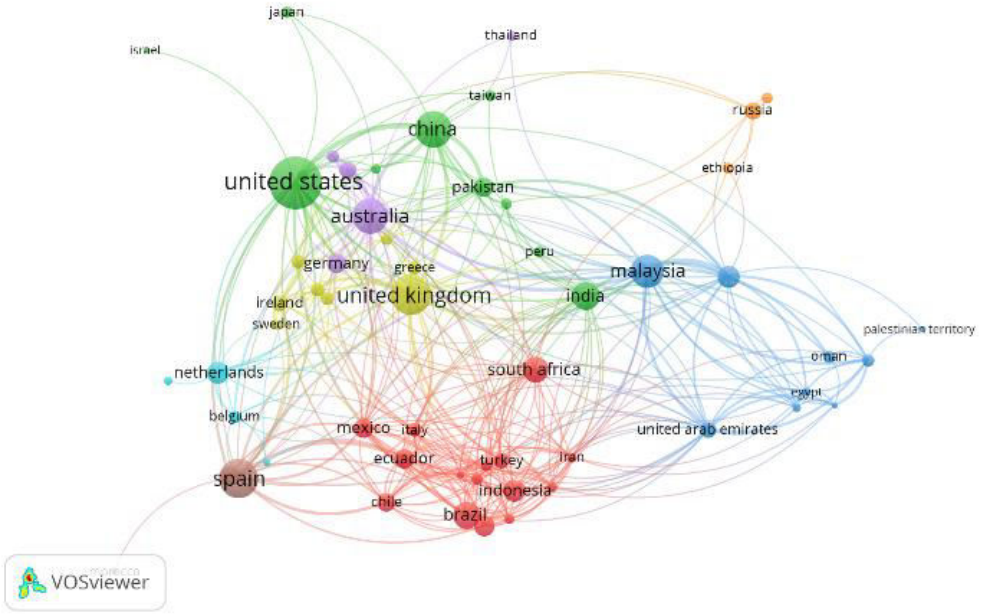

Figure 4: Network map of Co-authorship & Countries

Figure 4 represents the analysis between Co-authorship and Countries. There were 110 countries to choose from. The minimum number of documents country-wise was 5 and the minimum number of country-wise citations was 6 for 59 countries. Out of 58 items, 8 clusters were created, links connecting the clusters were 377 and the total link strength was 630.

Figure 5 is a density map of countries and co-authorship; this is actually figure 4. As the number of Citations keeps on increasing every year. The figure 6 shows the representation of changes in the number of citations.

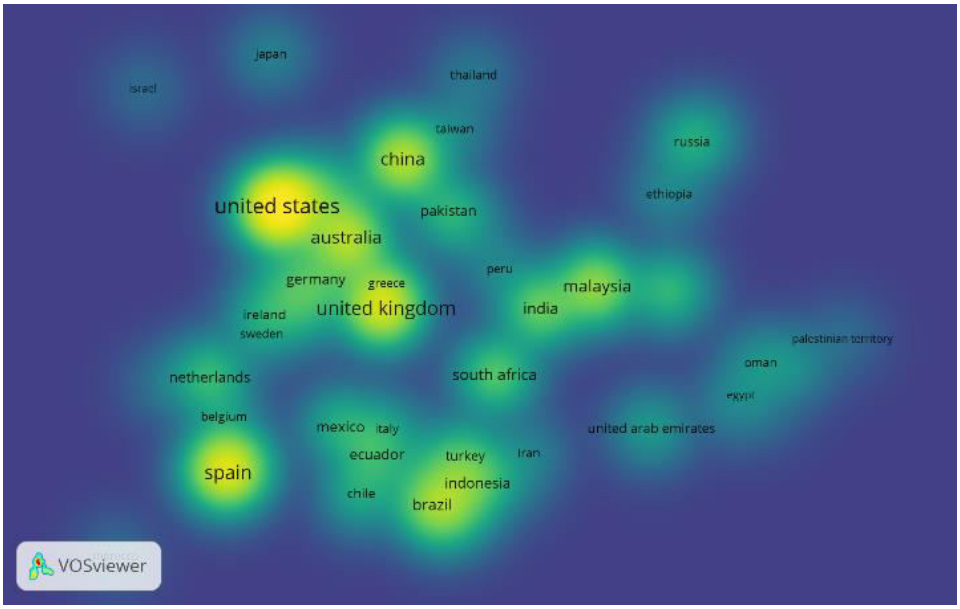

Figure 5: Density map of Co-authorship & Countries

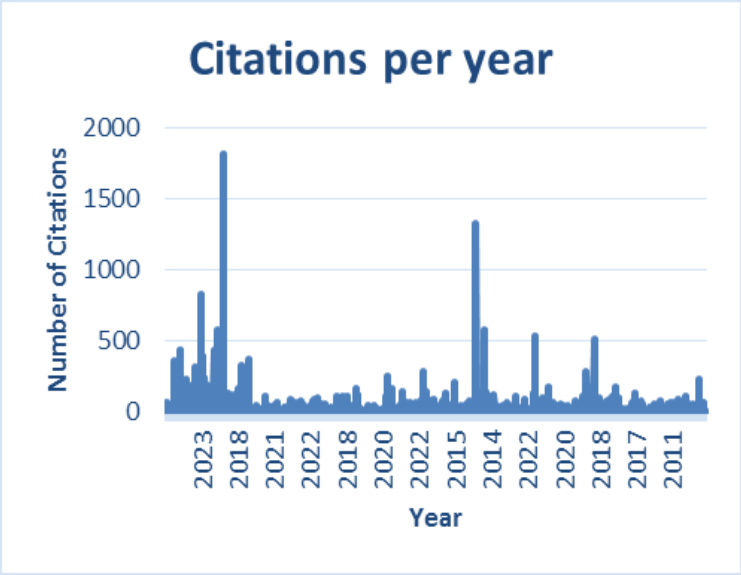

Figure 6: Trend of Number of citations per year

3) Citation and Documents

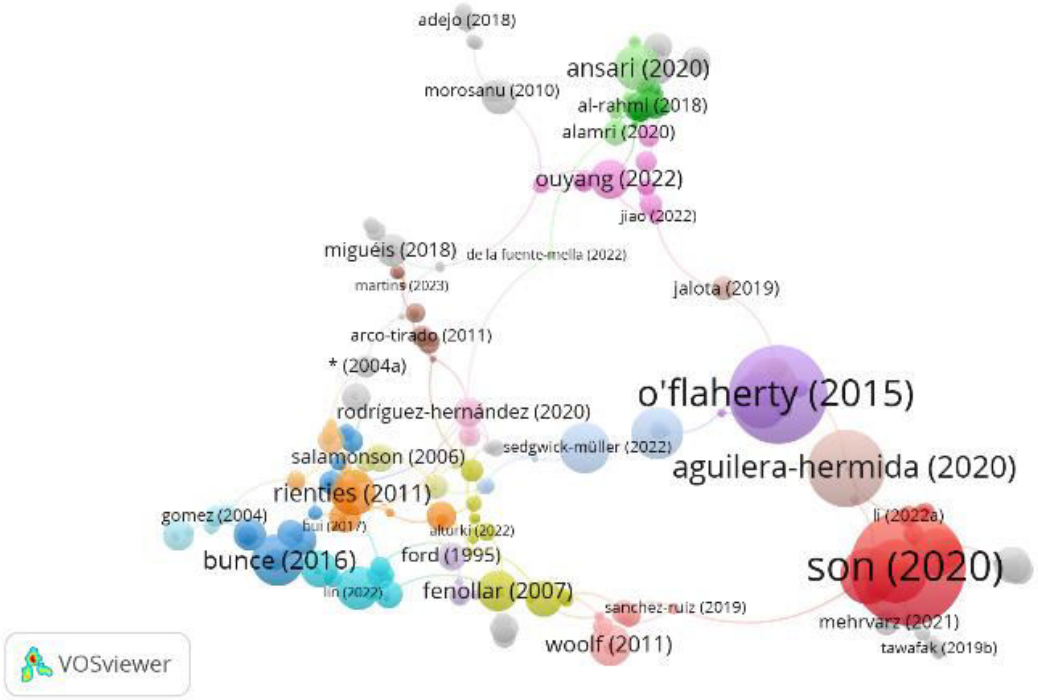

Figure 7: Network map of Citation & document.

Figure 7 illustrates the network map for the relationship between citations and documents. For the case under consideration, it is assumed that the minimum number of citations per document should be at least 5. Based on 2500 documents, 918 have reached this minimum. Among these 918 documents, the largest group of connected documents is 278. Within these 278 documents, there are 29 clusters with 378 links.

4) Citation and Source

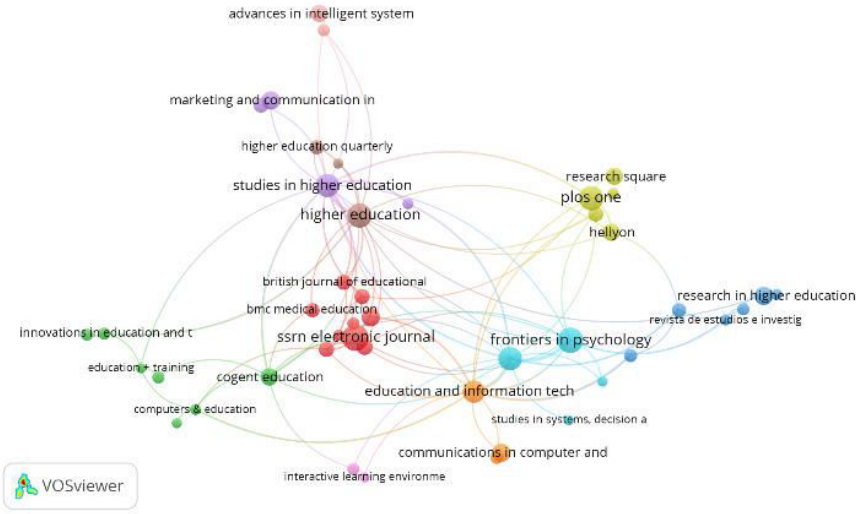

Figure 8: Network map of Citation and sources

Citations and sources study is shown in Figure 8. In this network, there are 5 documents for each source and at least 2 citations per source. Among 1477 sources, only 57 fulfil the minimum requirements. From these 57 sources, a few items were not linked in the network; thus 45 items were found to be connected, and therefore it was the most significant set of data. 45 objects grouped into 10 clusters and 92 connected links with a total of 128 possible links.

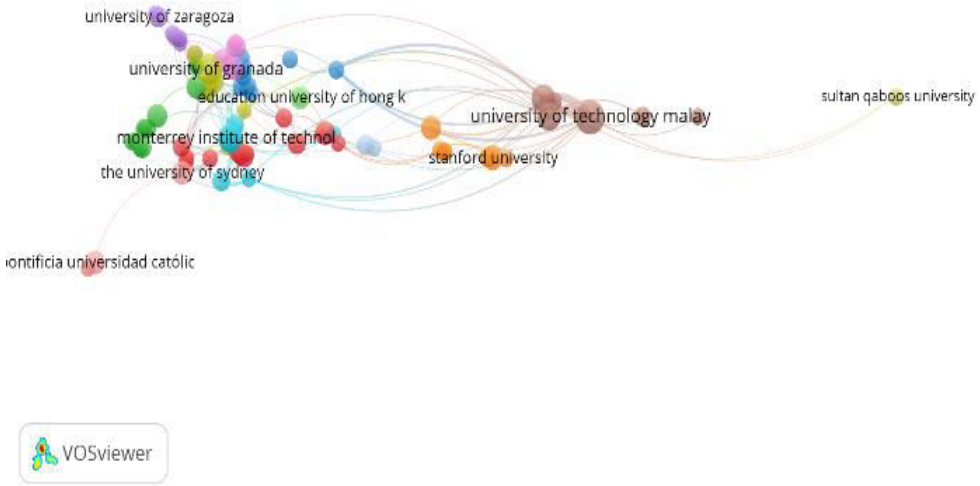

Figure 9: Network map of Citations and organizations

5) Citation and Organization

The above Figure 9 shows the network map of organizations and citations. Each organization must have at least 5 documents and at least 3 citations. Out of the 2074 organizations, 96 showed this requirement. Several items were not connected in the network, so the largest group of connected items was 84. The 13 groups were then created from these 84 items. There were 189 links connecting the groups and the total strength of the links was 449.

6) Citation and Countries

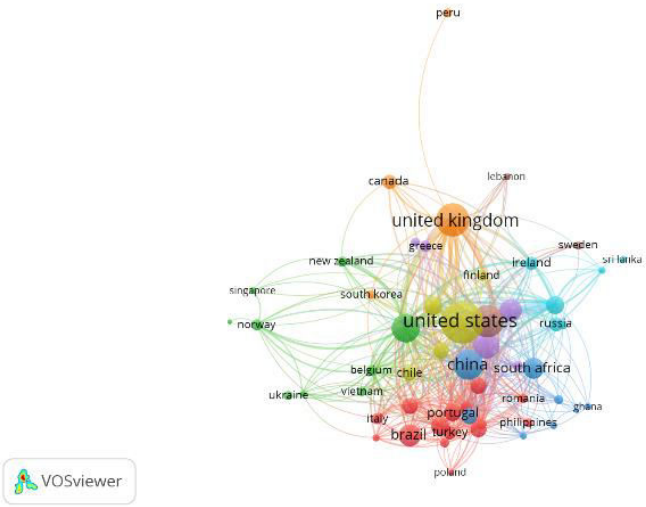

Figure 10: Network map of Citations and countries

Figure 10 represents citations as per different countries. It requires a minimum threshold value of 5 documents from any country and any citation element must occur at least 8 times in the data. In total, 110 countries are considered for the above analysis. Out of these, 59 meet the threshold. Out of the 59 countries, only 57 belonged to the strongly connected group that emerged as the largest connected component. For 57 countries, 8 clusters have been created. For these 8 clusters, the total links generated are 499. Total link strength is 1318.

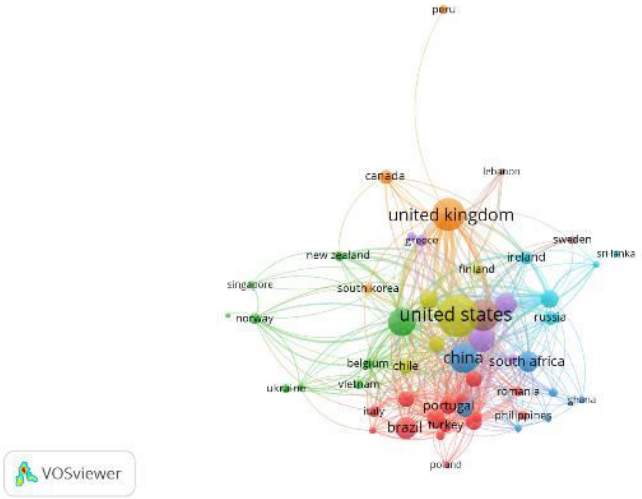

Figure 11: bibliographic coupling and Document network map

7) Bibliographic Coupling and Document

The least number of citations that a document should have is set at 10. Of the 2500 documents, this minimum was met by 646. 562 documents were selected out of the 646 ones, because they were connected in the network map and fell into 14 clusters. Links connecting these 14 clusters are 6277 and the total link strength is denoted by 10625.

8) Bibliographic Coupling and Source

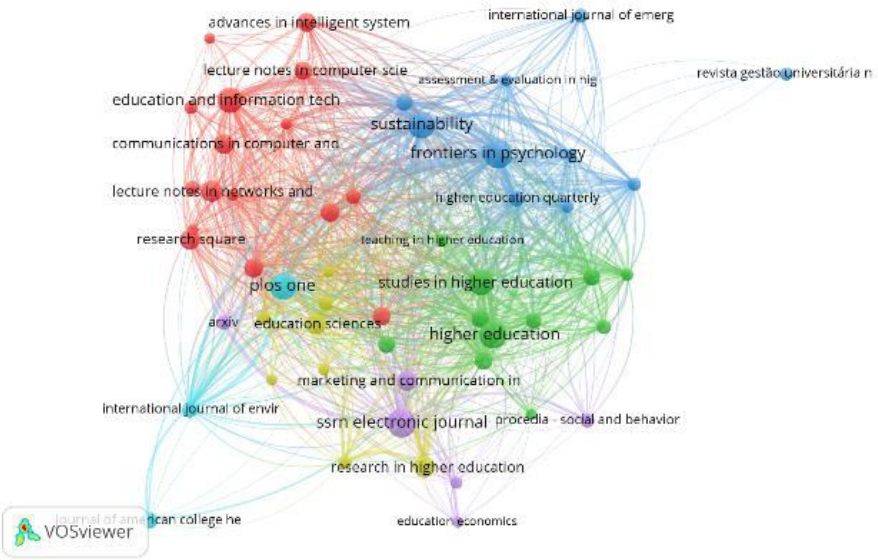

Figure 12: Network map of Bibliographic coupling and source

The network map shown in figure 12 represents the analysis between Bibliographic coupling & source. The threshold value of the minimum number of documents of a source is 5 and minimum number of citations of a source is 2. Out of 1477 sources, 57 met the threshold value. Out of 57 sources, 54 sources formed the largest group connected with each other in the network. These 54 sources formed 6 clusters connected with 940 links and total link strength 7646.

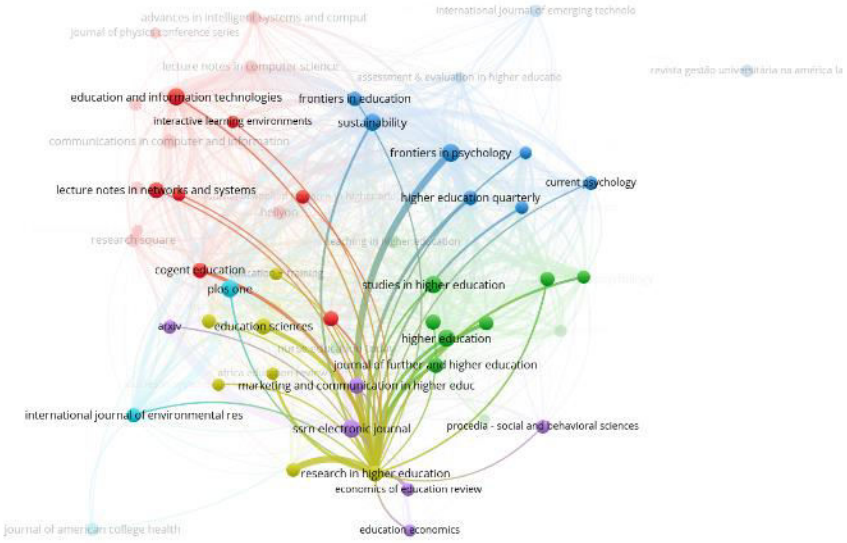

Figure 13: Network map of Research in higher Education as a source.

The network map shown in figure 13 shows graphical representation of the data related to the research done in higher education. The network map shown in figure 14 shows graphical representation of the data related to the research done in higher education on quarterly basis.

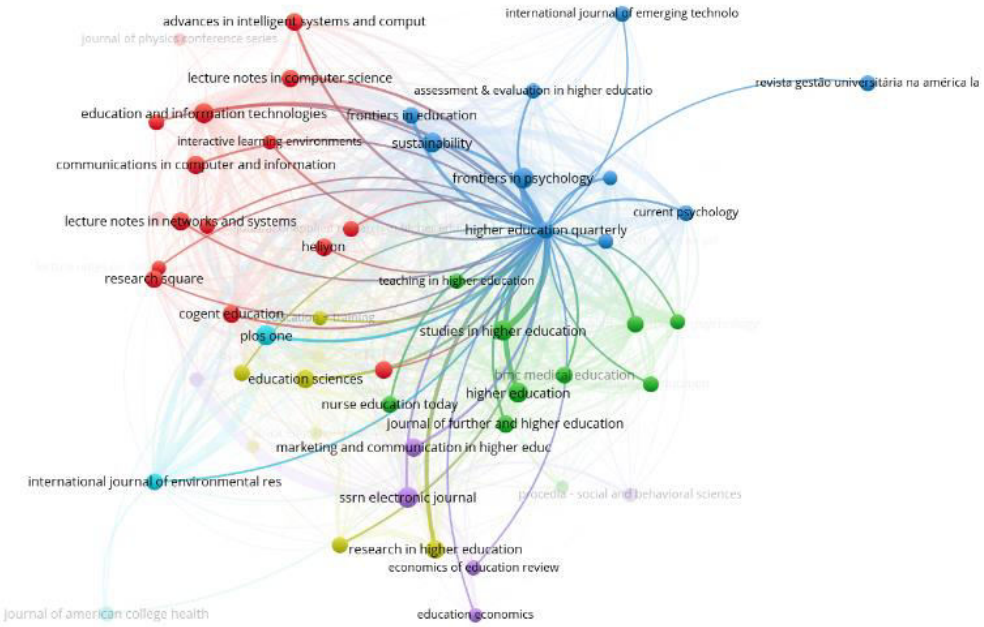

Figure 14: Network map of Research in higher Education on quarterly basis as a source.

9) Bibliographic Coupling and Organization

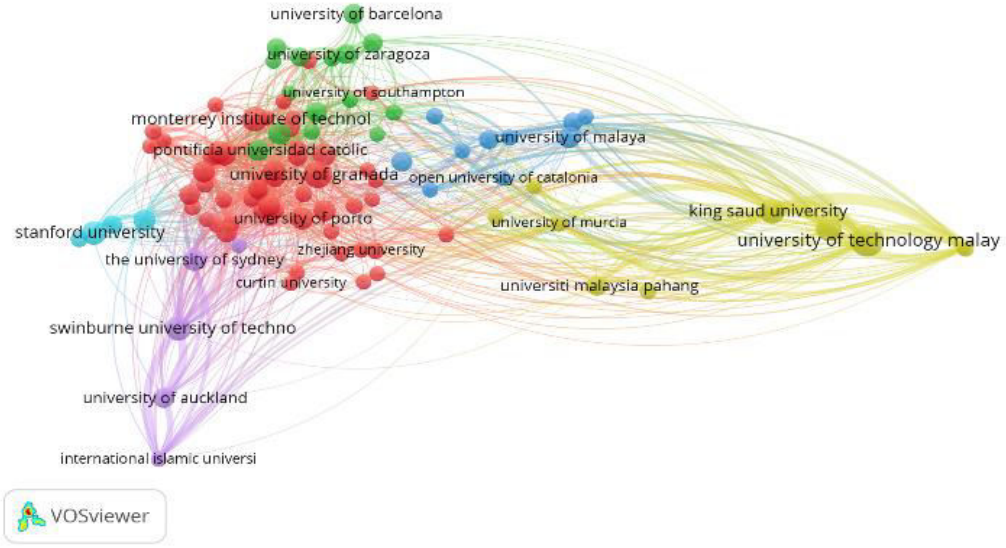

Figure 15: Bibliographic coupling and Organizations network map

The network map shown in figure 15 represents the analysis between Bibliographic coupling and Organization. The threshold value of the least number of documents of an organization was 5 and minimum number of citations of an organization is 2. Out of 2074 organizations, 97 meet the threshold value. Out of 97 organizations, 6 clusters are formed connected with 2508 links and total link strength of 21153.

10) Bibliographic Coupling and Countries

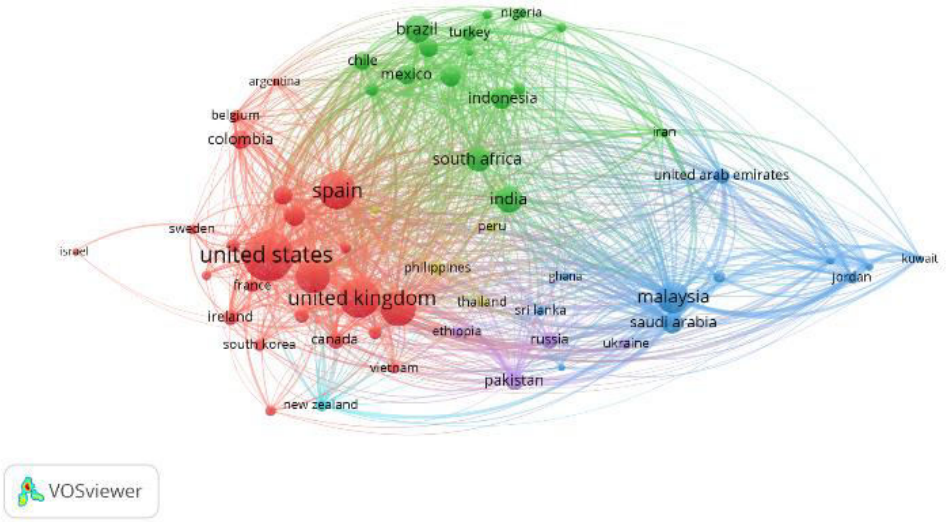

Figure 16: Network map of Bibliographic coupling and countries

The network map shown in figure 16 represents the analysis of Bibliographic coupling and countries.

The threshold value of the minimum number of documents of a country is 5 and the minimum number of citations of a country is 6. Out of 110 countries, 59 countries meet the threshold value. These 59 countries form a cluster of 6 with 1587 links and total link strength as 103966.

11) Co-citation and Cited Reference

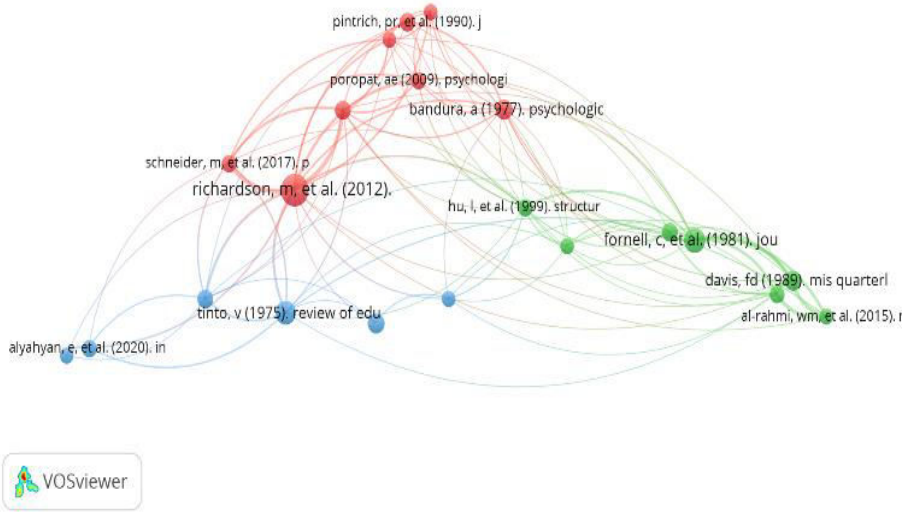

Figure 17: Network map of Co-citation and cited reference

The network map shown in the figure 17 represents the analysis between Co-citation and cited reference. The threshold value of minimum number of citations of an cited reference is 20. Out of which 45914 cited references, 21 met the threshold value. These 21 cited referenced were further classifies into 3 clusters with 98 links and total link strength of 307.

12) Co-citation and Cited Source

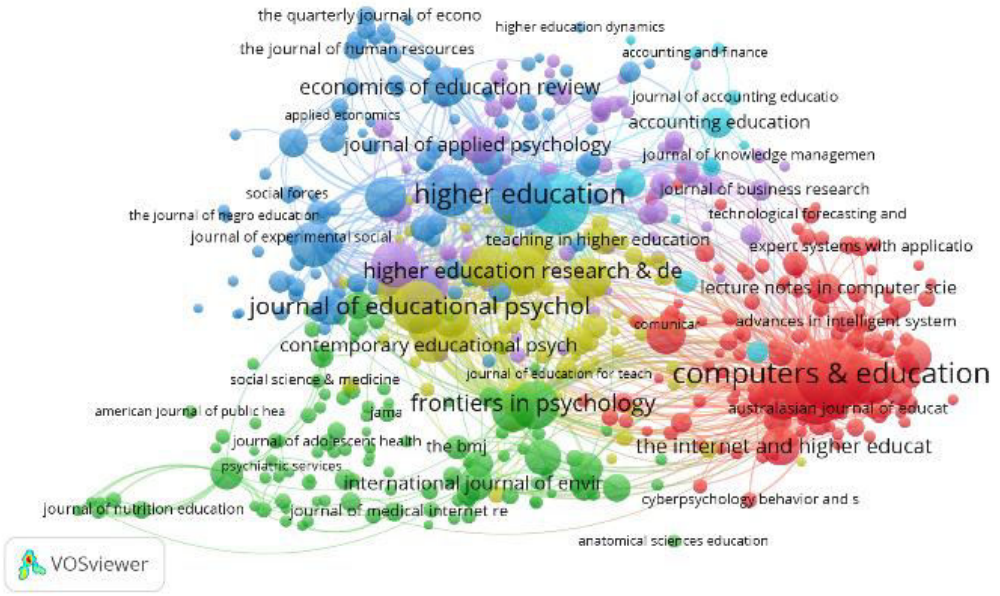

Figure 18: Network map of Co-citation and cited source

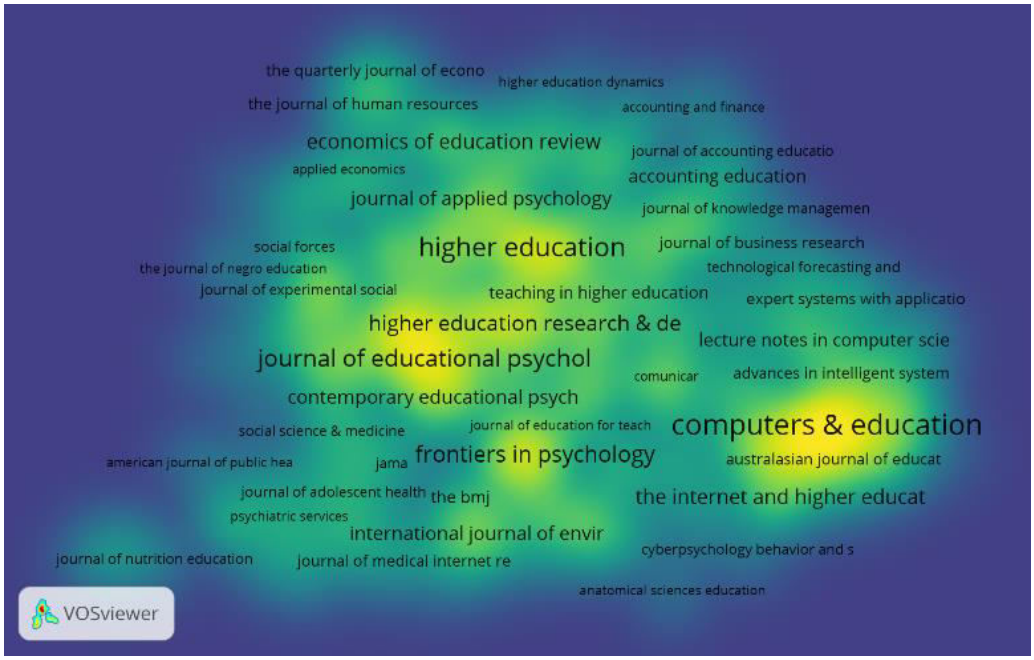

Figure 19: Density map of Co-citation and cited source

The network map shown in the figure 18 represents the analysis between Co-citation and cited source. The threshold value of the minimum number of citations of a cited source is 20. Out of which 9079 cited references, 528 met the threshold value. These 528 cited sources were further classified into 6 clusters with 70062 links and total link strength of 571951.

Figure 19 represents the density map of Co-citation and cited source.

13) Co- Citation and Cited Authors

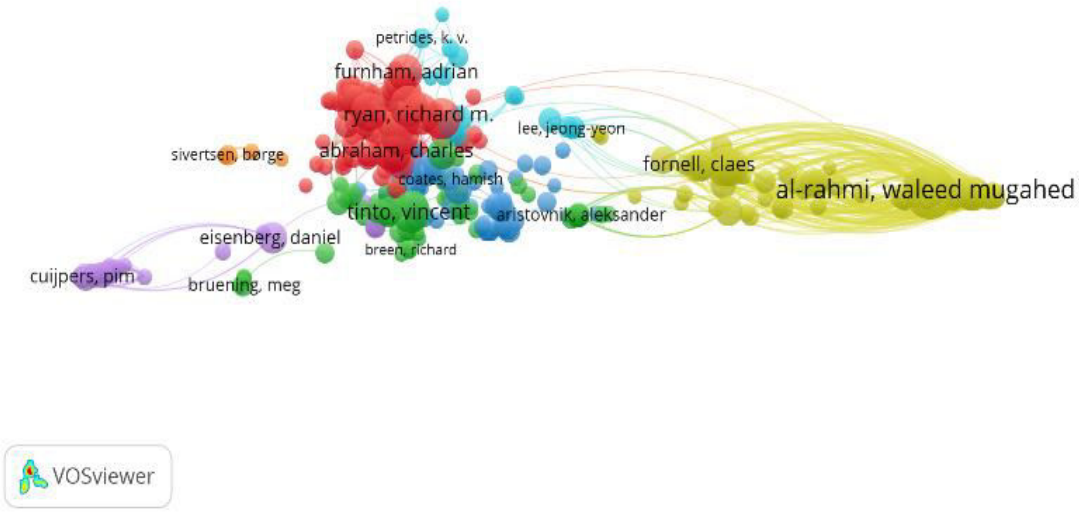

Figure 20: Network map of Co-citation and cited authors

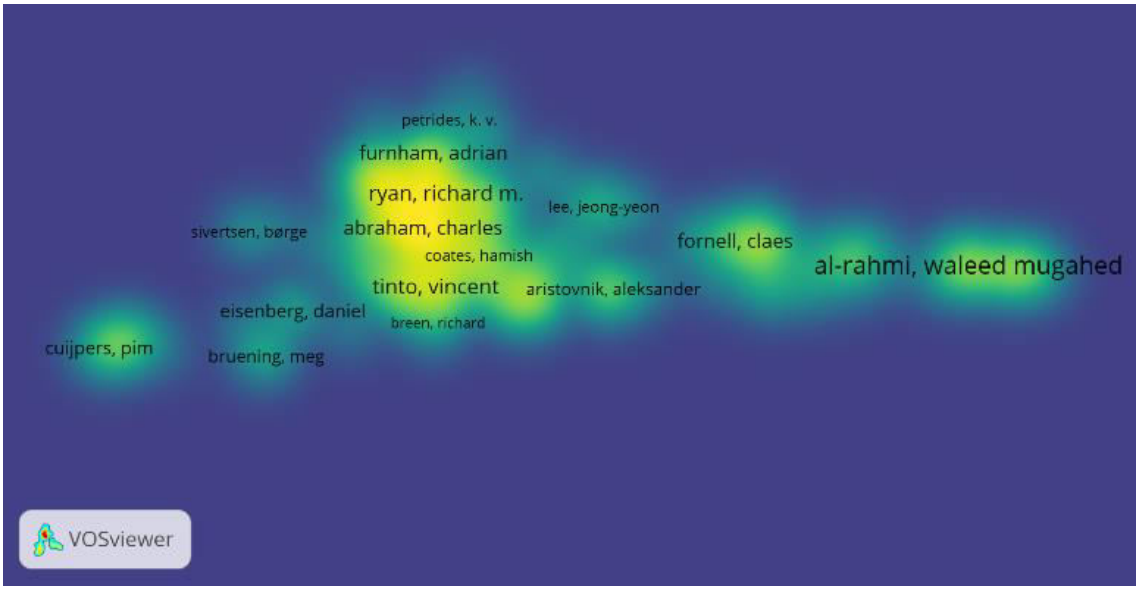

Figure 21: Density map of Co-citation and cited authors

The network map shown in figure 20 represents the analysis between Co-citation and cited authors. The threshold value of the minimum number of citations of a cited author is 20. Out of 104268 cited authors, 324 met the threshold value. These 324 cited authors were further classified into 7 clusters with 17276 links and total link strength of 128109.

Figure 21 represents the density map of Co-citation and cited authors.

IV CONCLUSION/FUTURE WORK

This bibliometric study analysed the trends in student performance in higher education system research from 1964 to 2024. The scope of this research paper is limited to Dimensions database. Future research scholars might do more research using WOS or Scopus databases to get more detailed insights in the emerging trend.

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