# Gender Diversity In Corporate Boardrooms –A Systematic Literature Review Using Text Mining And Network Analysis

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**Abstract**

Gender Diversity in corporate board rooms is much talked about topic in research which generated interest among researchers to explore it further to know in depth insight of different issues revolving around it, how it's been catered to bring solution to related problems. The author felt that there is need to look at different available digital articles and analyse them to understand the development of this concept over the time period. The study also introduces new way of systematic literature review based on text mining, and network analysis for the studies based on Gender Diversity and their role on corporate boards.

**Key Words:** Gender Diversity, Text Mining, Board of Directors, Corporate Boards, Network Analysis

**Introduction**

There is significant literature available on aforesaid topic which is suggesting the representation of women on board in order to bring gender equality in corporate world. Most of the studies have been conducted in developed nation whereas developing nations are lacking behind (Dissanayake et al., 2016), still we have miles to go in both worlds. Looking at general scenario of marginalised appointment of women directors on the corporate boards for many years, has brought in legislative interference on the part of government in order to enhance the representation of women directors on corporate boards (Solimene, Coluccia, & Fontana, 2017). It has given rise to the different studies revolving around measuring the impact and effectiveness of existence of women on Board. Nili (2019) studied the ongoing debate and explained that the debates have fixated on the ratio of women on board as compare to men. Norway took the lead in introducing gender quotas to address the issue of gender diversity on corporate boards later followed by other European nations. In US as well California was the first to legitimate gender quotas. These forceful actions are really achieving the goals or they just giving illusion of substantial changes (Aguilera et al.,2021). India has attempted for same by with the introduction of Companies act, 2013.

The forecast was made by Elgart (1983) that it could be nearly 2180 for females to reach the equality in boardrooms. After nearly 40 years, this forecast does not look overly pessimistic.

There is awareness among female directors on prejudice and attitudes that the existing male board members often display in further nurturing a gender bias. As a study on the Canadian boards, analyzed 278 women directors and recorded their responses. Burke (1997) stated that it is the Mindsets CEO or board chairperson being male is the main reason of under representation of women members on the boards. European Commission report of 2019 stated that number of women reduces as higher the hourly wage rate on an average. European Commission (2019) report showed the percentage of women board members in large public listed firms make up to 26.7 % in October 2018. There is only one EU nation that is France with 44% women at board level. McKinsey (2018) research showcased career progression as one of the determinants of lesser women presence at top. It was also found that there is poor hiring of women in technology industries and in many, women are stuck at middle or senior management level. The European Commission introduced "Women on the Board Pledge for Europe" with the aim of escalation of women participation on corporate boards, an appeal to European firms to come forward willingly to undersign the pledge to enhance the number of female board members in upcoming years. After initiation of this movement in 2011, legislative procedures were introduced by some Member States to achieve equality among both genders the on corporate boards (Solimene et al. 2017).

With all these initiatives still, women face obstacles to reach the higher ladder of top management in corporates, these obstacles are many from typical stereotyping to work life balance. There are specific terms which prominently comes out in literature to highlight this huge gap such as "glass ceiling", "glass cliff", "sticky Floor" (Cook and Glass,2014; Smith & Main,2018; Brown et al., 2020).

The purpose of this research paper is to analyze available literature in the Scopus database on women representation in corporate boards in purview of systematic literature methodology. For this purpose, Application of Knime software has been utilized which was used to conduct initial text Mining (Cai and Sun 2009). This tool enables the creation of network analysis (Ashwani et al., 2017) for comprehensive understanding of social and network analysis, it helps in visualization of outcomes which presents clear picture of observations and results that is easy to comprehend.

Initial step included use of main phrase and strings in search criteria of Scopus which resulted in to 637 results after filtering the data with various limiters result limited to 533 articles.The search conducted for this paper produced 637 documents from the Scopus, with a final total result of 533 documents after passing the initial results through various filters. Knime software and UCINET software was used to analyze the information, which enabled the network analysis of the authors. The outcome based on results represents major authors and researchers and studies of this area. It helps to identify recent trends in this subject which deals with corporate governance, sustainability, firm's financial performance also emphasizes the essential role of women on corporate boards.

The first part of paper gives analysis on number of journals published yearly and major journals publishing high numbers of articles on this topic. Second part gives idea bout major themes with the help of cluster analysis. Lastly, network maps provide insight on author networks followed by result and conclusion.

**Research Questions:**
1.What are the different trends in studies published on Gender Diversity on Corporate Boards?
2. What are the main themes emerging in the studies on Gender diversity in Corporate Boards?
3. Who are the main researchers and Key Authors of this subject.

**Design/methodology/approach –**This research work is based on systematic literature review in the field of Gender Diversity and Corporate Boards based on text processing and network analysis. The analysis has been performed with the help of KNIME software which is been used for the purpose of text mining and processing. KNIME is an open-source software developed in Germany by Konstanz University. UCINET software has been used to perform network analysis of authors. UCINET has been created for social network analysis and visualization. It's been created by Lin Freeman, Martin Everett and Steve Borgatti.

This research paper has adopted for systematic literature review (Mengist et al. 2020). Research Articles have been retrieved from Scopus database which is been considered the most comprehensive database for quality research papers (Grover et al., 2018). The data is been retrieved from Scopus in June 2020. While filtering the data there are advance filter option available in database which makes it easier to get the most relevant papers on the chosen subject.

For the initial phase we utilised search string as "Gender Diversity", "Women on Board", "Gender Equity", "Gender Equality", "Board of Directors" OR "Corporate Boards". Boolean phrases "AND" and "OR" were used to combine search phrases to create the complete string, which resulted in to combined phrase as "Gender Diversity" OR "Women on Board" OR "Gender Equity" OR "Gender Equality" AND "Board of Directors" OR "Corporate Boards".This process made sure that only research results which consists of these terms comes in to final research results. We applied a search on "Article Title" , "Article Keywords" and " Abstract" in first process of search in database. In the first step, it resulted in to 637 documents In the second step, we applied limiter as research articles in English language which resulted in to 538 research articles. In the third step only research articles published in journals were selected in source type which resulted in to 533 research. So for the final number of research article came out 533 for text processing and network analysis on chosen topic.
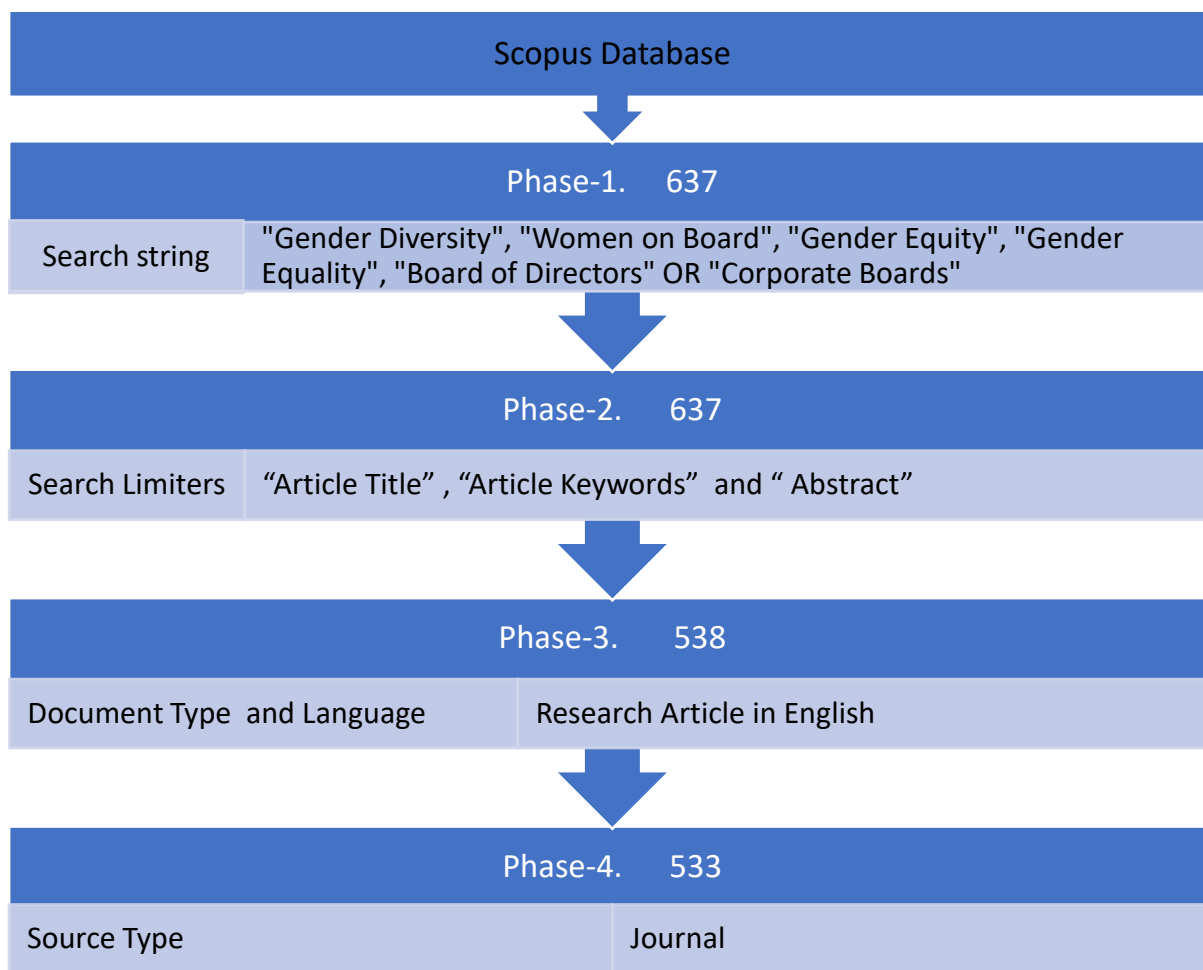
| Scopus Database |
| :---: |

| Phase-1.     637 | |
| :--- | :--- |
| Search string | "Gender Diversity", "Women on Board", "Gender Equity", "Gender Equality", "Board of Directors" OR "Corporate Boards" |

| Phase-2.     637 | |
| :--- | :--- |
| Search Limiters | "Article Title" , "Article Keywords"  and " Abstract" |

| Phase-3.     538 | |
| :--- | :--- |
| Document Type  and Language | Research Article in English |

| Phase-4.     533 | |
| :--- | :--- |
| Source Type | Journal |

Fig 1:Selection process of final Research Articles in Scopus Data base.

**Knime Work Flow**

Text Mining and Text Processing for the purpose of systematic review of available literature is been done through KNIME software with add on extension of text processing. Total 44 Nodes have been executed to get the main outcome such as year wise analysis, Journal wise analysis, further cluster analysis is been obtained along with word cloud by analysing keywords and title.
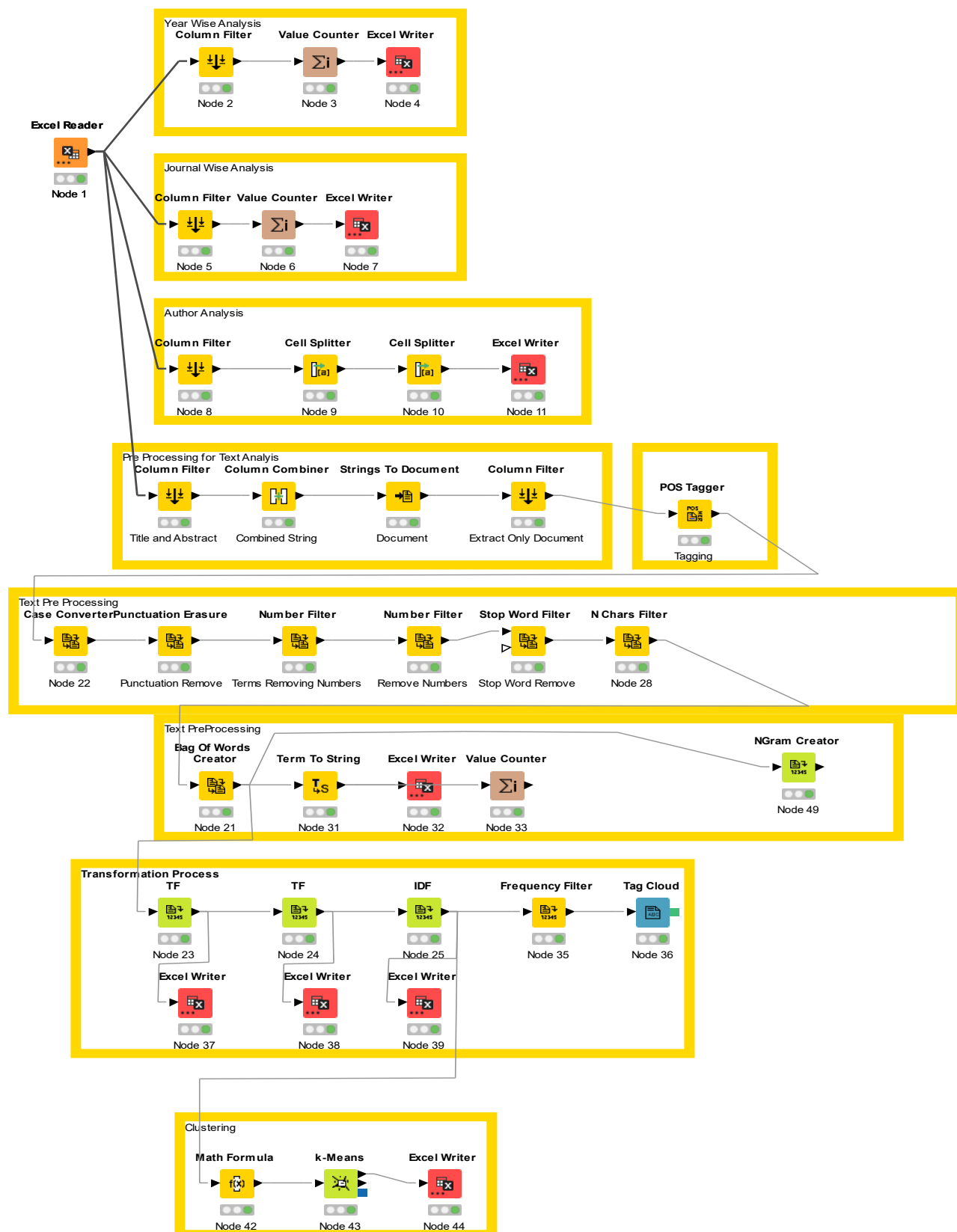
**Figure 2 represents workflow of text mining and text processing in KNIME software**

**Analysis and Findings**

In this section analysis and findings have been included after text mining and network analysis process. First Part includes year and journal wise analysis. Later keyword analysis is been done with tag cloud generated through KNIME ,later cluster analysis has been done which segregates the available literature in clusters. Five main clusters have been discussed further to come on conclusion regarding main themes related to gender diversity and corporate boards. Later section discuss network analysis generated through UCINET to demonstrate the association among key authors of this area.

**Year wise and Journal wise Analysis**

Figure 3  presents the data analysed with Scopus database on year wise publication. Further the papers were analysed based on keywords and titles by applying word cloud through knime software to have insight about main themes by applying method of text mining.

Figure 3 presents the data of 533 published research articles in journals since 1994. With the visualization we can conclude that it is only after 2010 when there is an increase  in publication number and year 2020  demonstrates the highest number of publication so far.
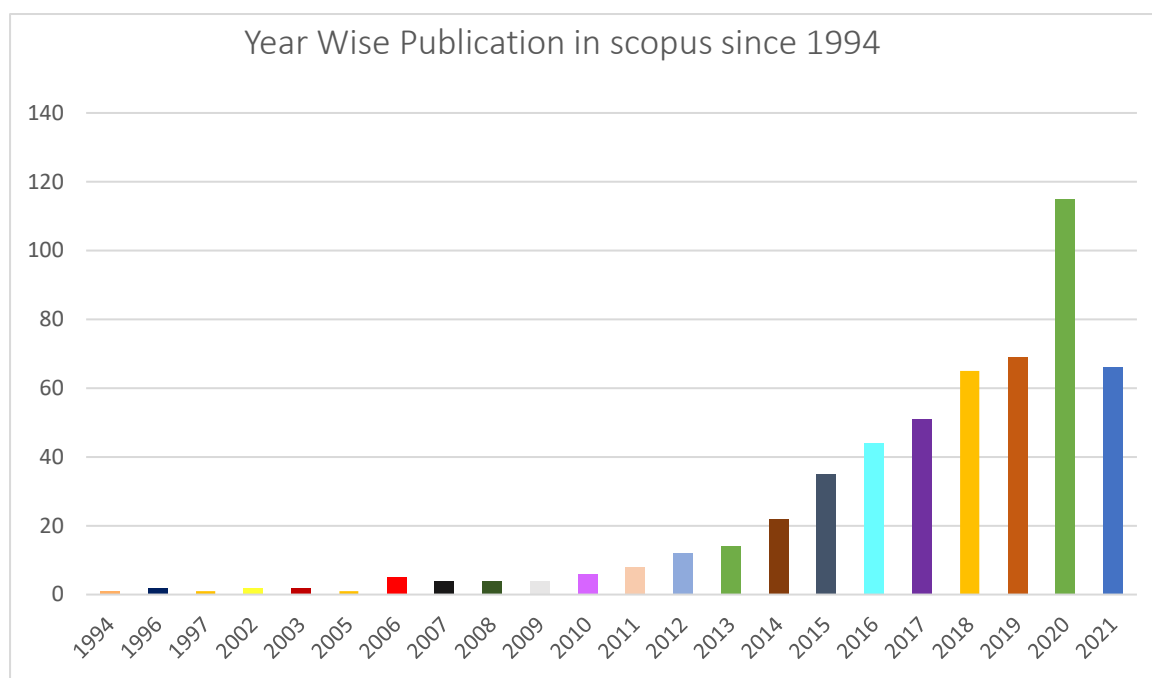


Fig 3 demonstrates the number (N) of papers published year wise in Scopus indexed Journal.

Further there is representation of top 10 most preferred journal for the publication in this particular area. With the help of text mining it is clear that the most preferred journal for publication on gender diversity and corporate boards is Journal of Business Ethics followed by journal of Corporate governance and then journal of sustainability.
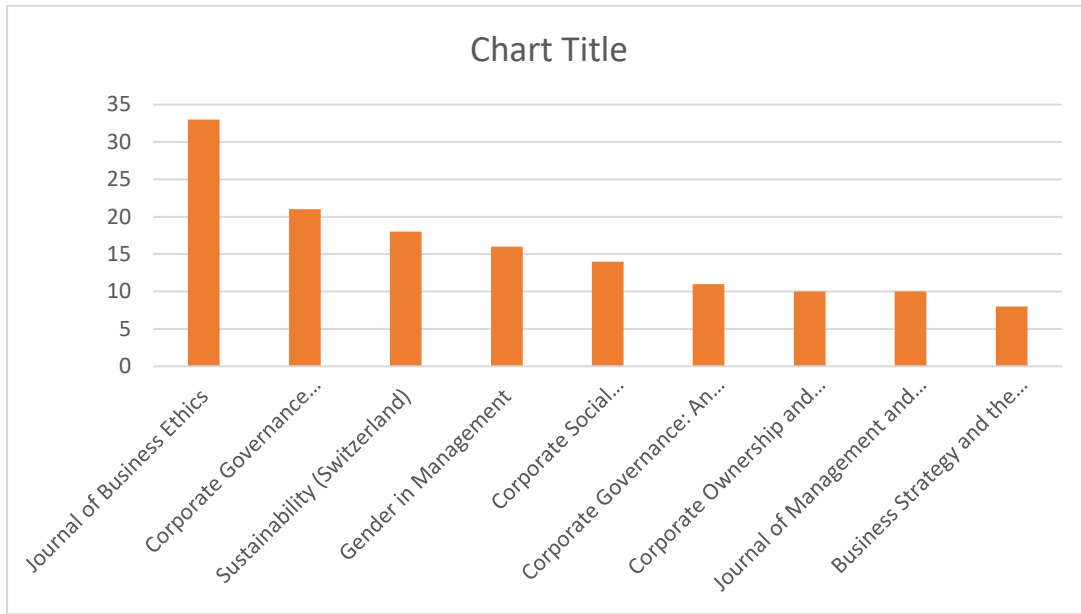
Fig 4 demonstrates the top 10 Journals and number (N) of papers published.

**Key word Analysis**

This analysis represents most commonly and frequently used terms in research articles based on co-occurrence of the terms. This analysis is been performed via setting threshold limit for re- occurrence of the key terms. In addition to that word cloud is been created with the help of tag cloud in KNIME to show showcase most commonly occurred words in the keywords and title of the research papers. We can see in figure 5 that most common reoccurred words in the available which are "Gender Diversity", "Social Environment", " Governance", "Performance".



**Fig. 5 represents word cloud showcasing most common occurring words.**

**Author collaboration network analysis:**

From the initial database of 533articles from Scopus, authors list was extracted and prepared as a node list. A sample of node list is shown in Table. This node list was used as an input to calculate the centrality measures. In this work, degree centrality measure is used to identify the authors with the most number of collaborating authors. Higher the degree value, more the number of collaborating authors. The result of this measure is given in Table:

Table1: Measures of degree

| Authors | Degrees |
|---|---|
| Ahmed A. | 9 |
| Seierstad C. | 8 |
| Gull A.A. | 7 |
| Terjesen S. | 7 |
| Abdellatif W. | 7 |
| Elmagrhi M.H. | 7 |
| Saeed A. | 7 |
| Nadeem M. | 6 |
| Bruna M.G. | 6 |
| Usman M. | 6 |
| Gabaldon P. | 6 |
| Qayyum A. | 6 |
| García-Sánchez I.-M. | 6 |
| Afriyie S.O. | 6 |
| Chang J.H. | 6 |
| Lucas-Pérez M.E. | 5 |
| Grau P. | 5 |
| Manita R. | 5 |
| Shahzad F. | 5 |
| Baixauli-Soler J.S. | 5 |
| Ben-Amar W. | 5 |
| Mazzotta R. | 5 |
| Li J. | 5 |
| Arena C. | 5 |
| Hansen E. | 5 |
| Hassan R. | 5 |

Author's collaboration network: Node list was then used to create a network graph in Net Draw tool. The size of the node is proportional to the node degree and the nodes are represented with different colors for different values of node degrees (red – node degree 6, 7; green – node degree 4,5; clue color – node degree 3 and less).
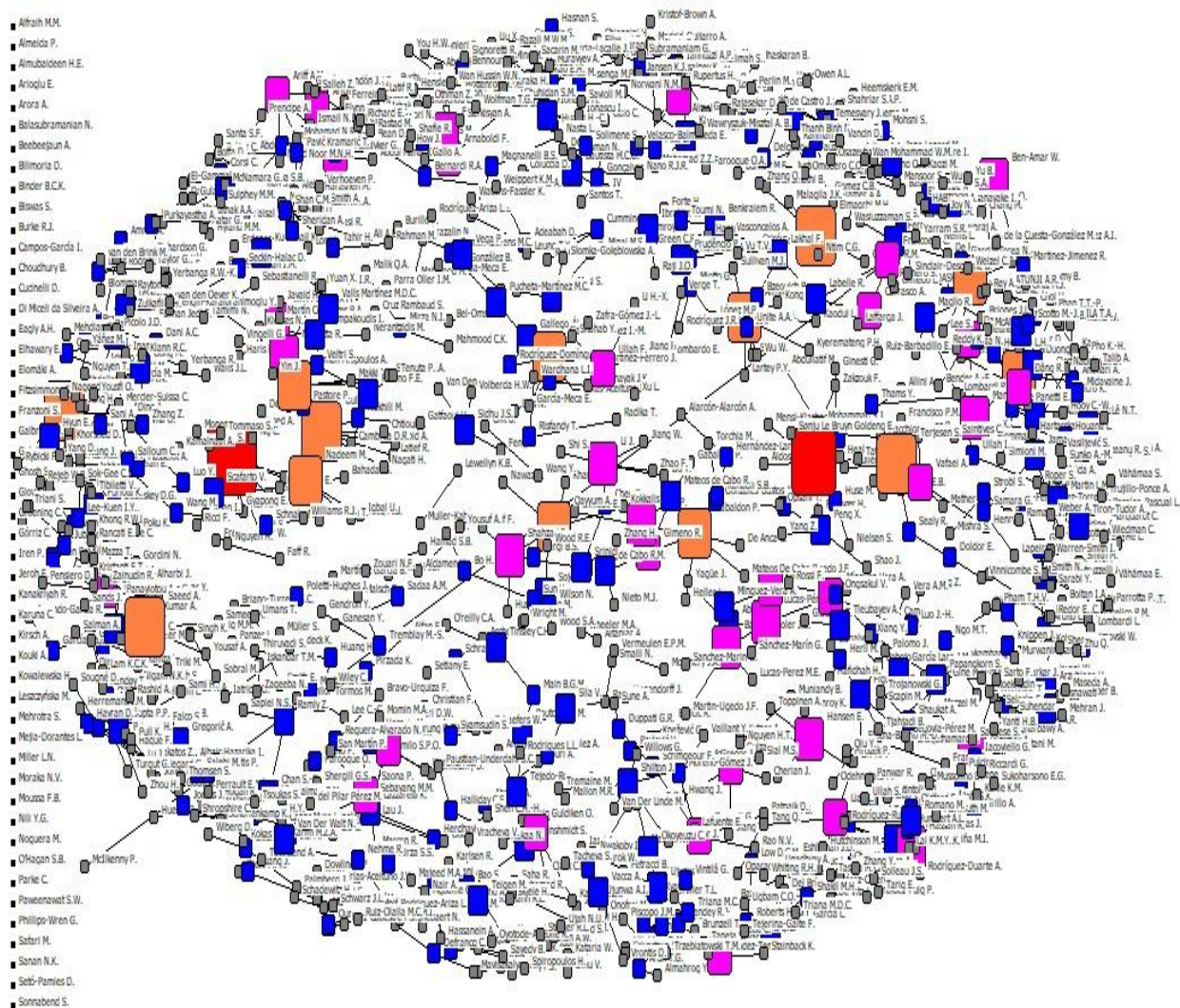
Figure6: Authors collaboration network

**Conclusion:**

The overall analysis presents useful insight for further research as it shows emerging trends where further future research can be attempted in more in depth to get better understanding of these emerging areas. It also emphasise on important characteristics and attributes of women which have impact on firm performance in to different dimensions. However this analysis has it's limitation as it comprises of single database source , more comprehensive studies can be done by including other database which give more clear picture on this subject.

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