PROJECT MANAGEMENT STRATEGIES FOR THE EV AUTOMOBILE INDUSTRY-REVIEW OF LITERATURE

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ABSTRACT

Electric vehicles are the best solution to fight against the pollution that happens because of transportation. It is the best option for the automobile industry but this industry needs specific management strategies to improve organizational performance and features. The purpose of this study is to identify different types of bibliographic maps (maps are based on network data and bibliometric data) The goal of this study is to analyse& improve the effective project management strategies for the organizational performance of the electric vehicle industry. Analysis of the project management strategy proposed in the literature was helped to identify the main research direction which can be used to design optimal project management strategies for the electric vehicle industry to improve organizational performance based on the existing research and current condition of the automobile industry. The analysis was performed with different methods and validated using the different tools and representation methods in VOS viewers, Biblioshiny, and Excel. We made bibliometric analyses from various perspectives. We have made an analysis of the project management strategies and electric vehicle users all over the world. We analysed data and expressed in various maps. It is based on the connections with the geographical distribution and the different strategies used to improve the project management strategies in the electric vehicles industry.

Keywords : Project management, Electric vehicles, Scopus, VOS viewer

INTRODUCTION

Environment and evaluation are important topics nowadays. The only solution to avoid pollution from the automobile industry is an electric vehicle. It is the evaluation and development of the electric vehicle industry. Evaluation of the new electric vehicle technology and development towards the project management strategy of the electric vehicle industry to improve organizational performance.Researchers from all over the world trying to improve management strategies. Fossil fuel emission is the main cause of climate change. Fossil fuel is the main reason for global warming. To overcome and recovering of the environment from the automobile industry, an electric vehicle is solution nowadays.

This study presents the bibliometric analysis using the tools Biblioshiny, VOS viewer, R-Studio, and Excel with the selected data from Scopus on subject project management strategy and electric vehicle. From last 32 years multiple papers are published on the project management strategy and electric vehicle on the Scopus. The selecting of data is very difficult without the

filters with the help of the filters. Collected the data and cited the references and that are ready to analyse.

The analysis over the top 120 most cited publications. Using the keywords like project management and electric vehicle. The selected publications for the database and extracted the useful information (Average, most frequent words, most relevant sources, Top trend, etc). The goal of this study is to display the project management strategies for the different topologies and systems. This study addresses the project management strategic view. The strategic analysis reports are based on the biomatrix analysis results. Which are going to represent geographical areas and the years of development and the current research. The output of the bibliomatrix analysis helps us to propagate the result. This study is important for the different potential of the project management strategies for electric vehicles.

METHODOLOGY

Research Criteria

The Google Scholar and Scopus databases were used to conduct the initial stages of the research. Numerous high impact publications and research items can be found in both databases. We no longer use the Google Scholar database due to its flaws, which include the inability to narrow down frequent author name searches and the abundance of unreviewed sources. Additionally, it contains background noise unrelated to scientific research. Because it has the most citations and abstracts of studies, peer-reviewed books, and journals, the Scopus database was selected for this study. It also provides cutting-edge tools for monitoring, evaluating, and contrasting studies. "Project management" was the keyword used for the initial search in the Scopus database, which returned 69789 documents. Because managing this volume of information was too challenging, modified search was carried out.

Document type	Document count	Criteria for Analysis
article	29	Included
book	1	Excluded
conference paper	70	Included
Review Article	13	Included
note	1	Excluded
review	5	Excluded
short survey	1	Excluded
Table 1 -Data Summary		

The primary data from the.csv file is imported into the Biblioshiny software as bibliographic data, and the results are shown in Table 2. Results were obtained for the period of time from 1981 to 2023. There were 120 total documents obtained, with an average of 10.94 citations per document, 1484 references used, and 141 total keywords plus generated by the algorithm. 87 sources, with an average annual growth rate of 2.72%.

Description	Result
Timespan	1981:2022
Sources (Journals, Books, etc)	87
Documents	120
Annual Growth Rate %	2.72
Document Average Age	13.7
Average citations per doc	10.94
References	1484
Table 2 - Main Information about Data Collected	

Publication Growth Pattern

It started since the phrase "Project Management" was by researchers from the CPM/PERT just prior to world war 2, Snyder and Kline noted that in 1987 the project management term is started from 1958 and project management comes from the chemical industry.After the 1950's the project management terms are developed by the Navy in their Polaris Project. Management term has been practiced for the thousands of years since Egyptian era. During the 1960's and 1970's, the Department of Defence,NASA, and large engineering and construction companies utilized the project management principles. In the 1980's the manufacturing and software industry started using project management principles to manage budget and time. In the 1980's automobile industry project management strategies are started to adopt and implement project management principles and after the the as per the requirement project management strategies are developed as per the project. In 8 phases annual article publication is developed from 1981 to 2022 around 72 articles are published in this period. From 2003 to 2008 the article published ratio is high for project management strategy in the automobile industry. Automobile industry is developed in smart way and improved various project management strategies in EV industry.
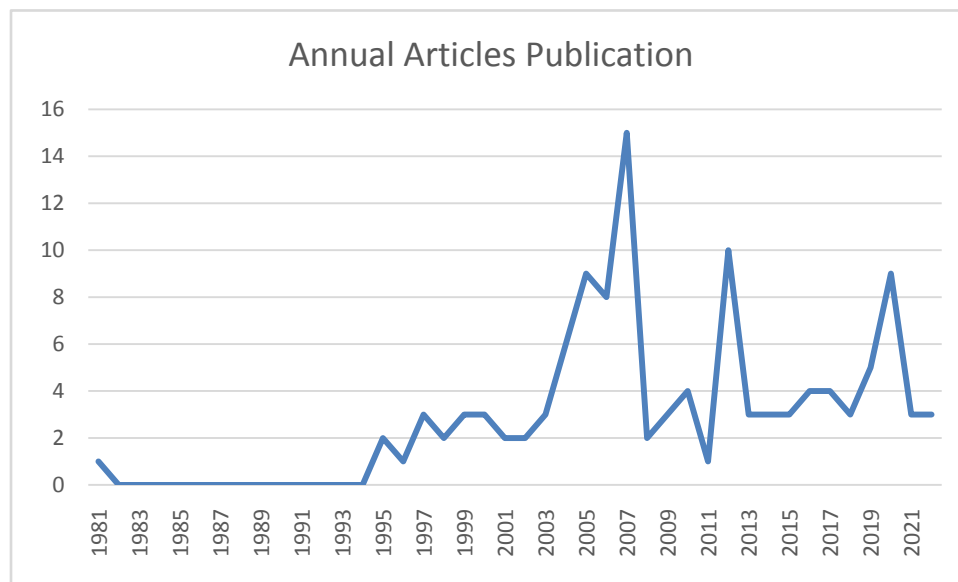

Figure 3: Annual Articles Publication

PERFORMANCE ANALYSIS

Performance analysis is used in bibliometric studies to take study participants' contributions into account. By examining the volume of papers published, this analysis assists in the identification of significant and fruitful topics. Biblioshiny R is recommended when choosing a software programme for performance analysis because of its superior user interface and visualisation capabilities for analysing publication and citation metrics.

Top 10 Contributing Journals

In Table 4, the researcher's primary references are presented, highlighting the top journals they frequently consult. Two noteworthy publications in this field are the International Journal of ELEKTRISCHE BAHNEN and the Journal of Management. The former has 34 documents, while the latter has 19 documents. The impact factor can be a valuable measure to assess the relative importance of a journal, particularly when comparing it to others within the same field. The EV industry is in the growing stage in this time period as per the article count and these top 10 journals are the high-impact factor

Sr. No.	Sources	Articles
1	ElektrischeBahnen	34
2	(Management 2,016)	19
3	Res Policy	16
4	Appl Energy	15
5	Energy Policy	14
6	Int J ProjManag	10
7	International Journal Of Project Management	9
8	Journal Of Product Innovation Management	9
9	Transport Res A	8
10	European Journal Of Operational Research	7

Table 4: Most Contributing Journals

Country-wise Contribution to Electric Vehicles

From 1981 to 2022 the country-wise contribution of articles to the Electrical vehicle industry is shown in figure 5. Mostly unknown countries article count is high but the top 5 countries are China, United Kingdom, Japan, Canada, and Sweden. These top 5 countries are started innovation in Electric vehicle industry. The project management strategies are developed in this time period for the electric vehicle. These below-shown countries majorly used methodological approaches for writing the papers.
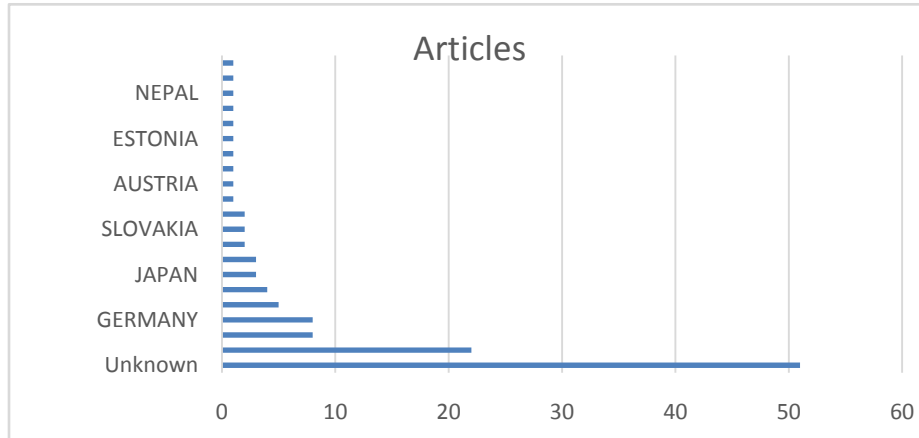
Figure 5: Country-wise Contribution to Electric Vehicles

KEYWORD ANALYSIS

Keyword analysis helps identify the most commonly used keywords in the research. It is noted that "Project Management" is the most frequently used keyword. During the evolution phase of the Electric vehicle industry, which spanned from 1981 to 2022, the highest growth in research was observed, with impactful studies taking an average of 10 years. Figure 6 highlights the trending topics, including Electric automobiles, Hybrid electric vehicles, Racing automobiles, Project management, Sustainable development, and vehicles. These topics have been progressing and gaining advancements since 2007.
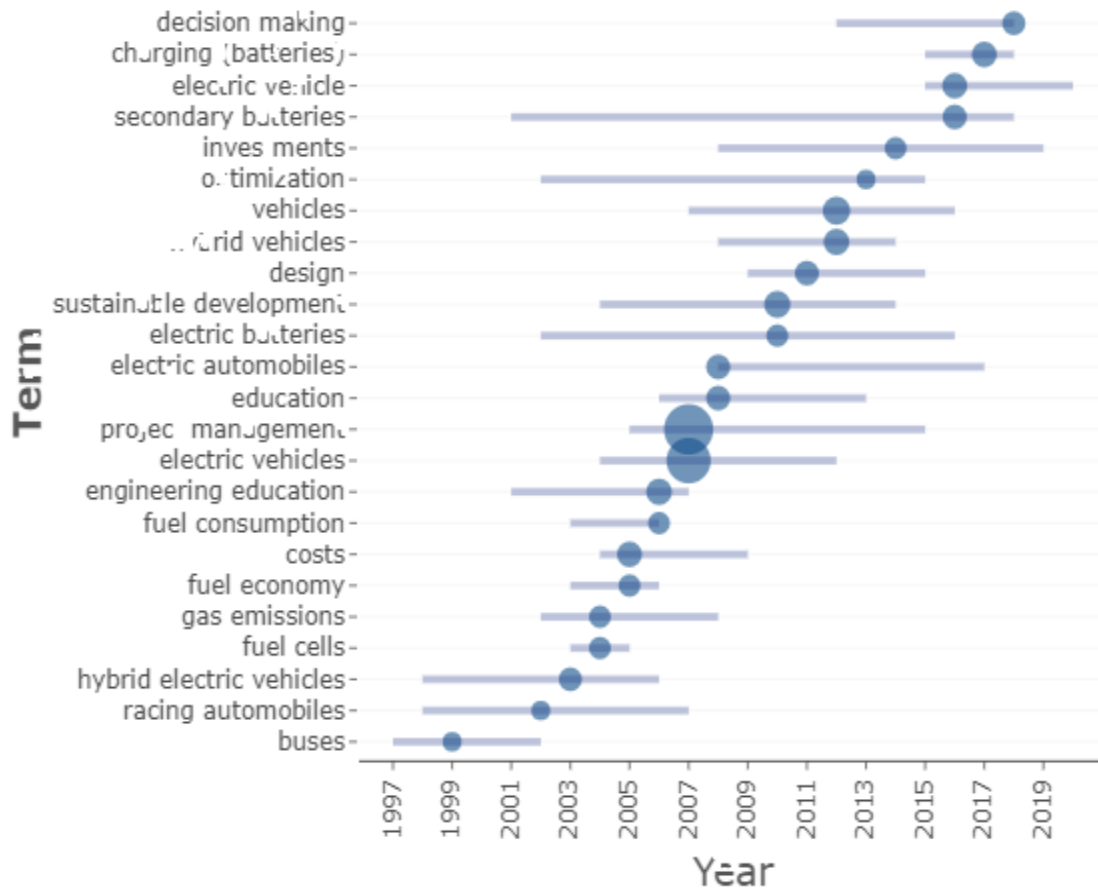
Figure 6 : Keywords Trending in Project management strategies and electric vehicles

CUMULATIVE OCCURRENCE

Below is the cumulative word graph that shows that terms like Automotive industry, Electric vehicles, Project management, Engineering Education, Vehicles, Hybrid vehicles, and Sustainable development are frequently used. From 1981 to 2022 the words are indicating the development phase of the Electric vehicle industry. Project management and Electric vehicle words are used frequently as per figure 7.
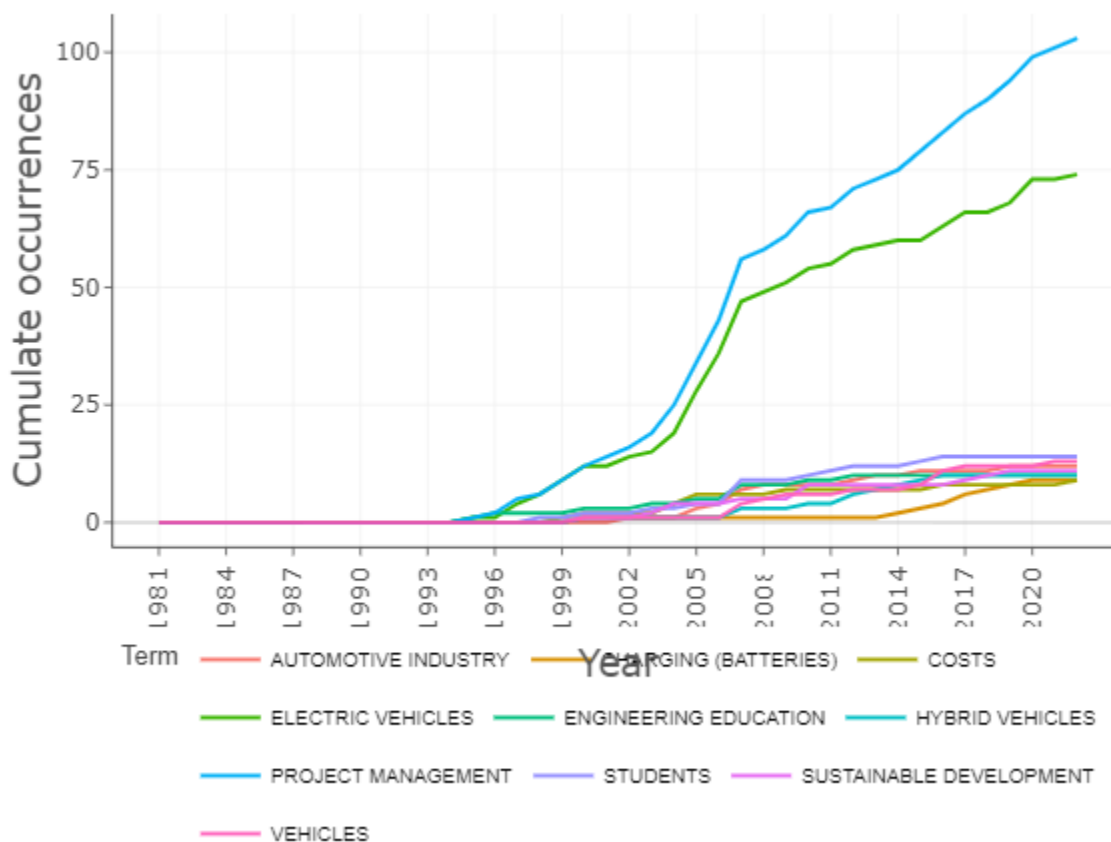
Figure 7: Word Dynamics graph of Electric vehicles

SCIENTIFIC MAPPING

By summarising the bibliometric structure and intellectual structure of a particular field, science mapping. It emphasizes the connections between research elements and enables the evaluation of productivity at the author, institutional, or country level. Science mapping encompasses various methods and techniques used to create visual representations of scientific knowledge. VOS Viewer is the preferred software tool for science mapping due to its superior visualization capabilities for thematic maps compared to the Biblioshiny Tool.

Tree Map of keywords

Tree mapping is an effective visual technique employed in bibliometric analysis to illustrate the interconnections and distribution patterns of keywords within a research dataset. This approach arranges keywords in a hierarchical tree structure, determined by their frequency or relevance. Each keyword is represented by a rectangular area in the tree map, with its size and

colour indicating its significance or occurrence frequency in the dataset. This method enables researchers to swiftly identify and examine the most noteworthy and recurrent themes or topics present in the dataset. By visually mapping the keywords, valuable insights can be gained regarding the underlying patterns and relationships within the field of study. In below Figure 8, each colour indicates a different keyword and percentage. The tree map of keywords is different in size as per the keyword strength.
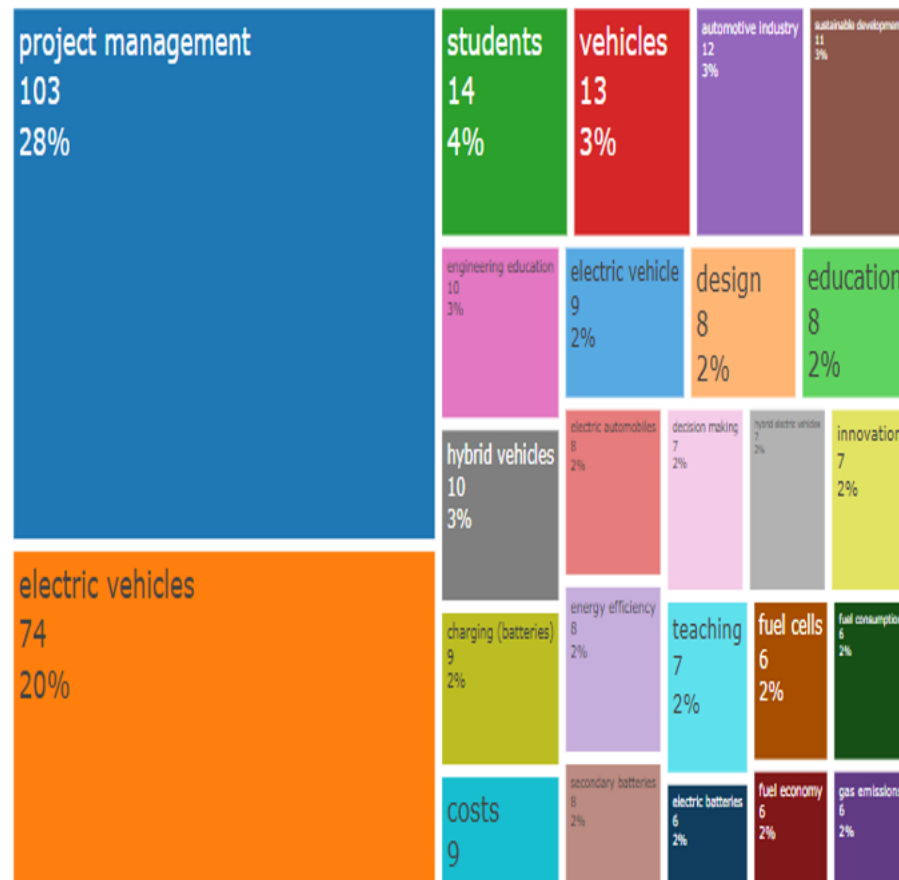

Figure 8: Tree Map of keywords with the percentage

Co-occurrence Analysis

The relationships between the listed authors are discovered using a keyword co-occurrence analysis, in which a common cluster of keywords denotes a common theme. A total of 358 keywords were used, and those with at least 34 occurrences were chosen, resulting in 84 identified results. Thematic map development was carried out by examining keyword co-occurrence to identify specific themes. The major themes identified include Project Management, EV manufacturing, Electric Vehicle, and Project Management Strategy.
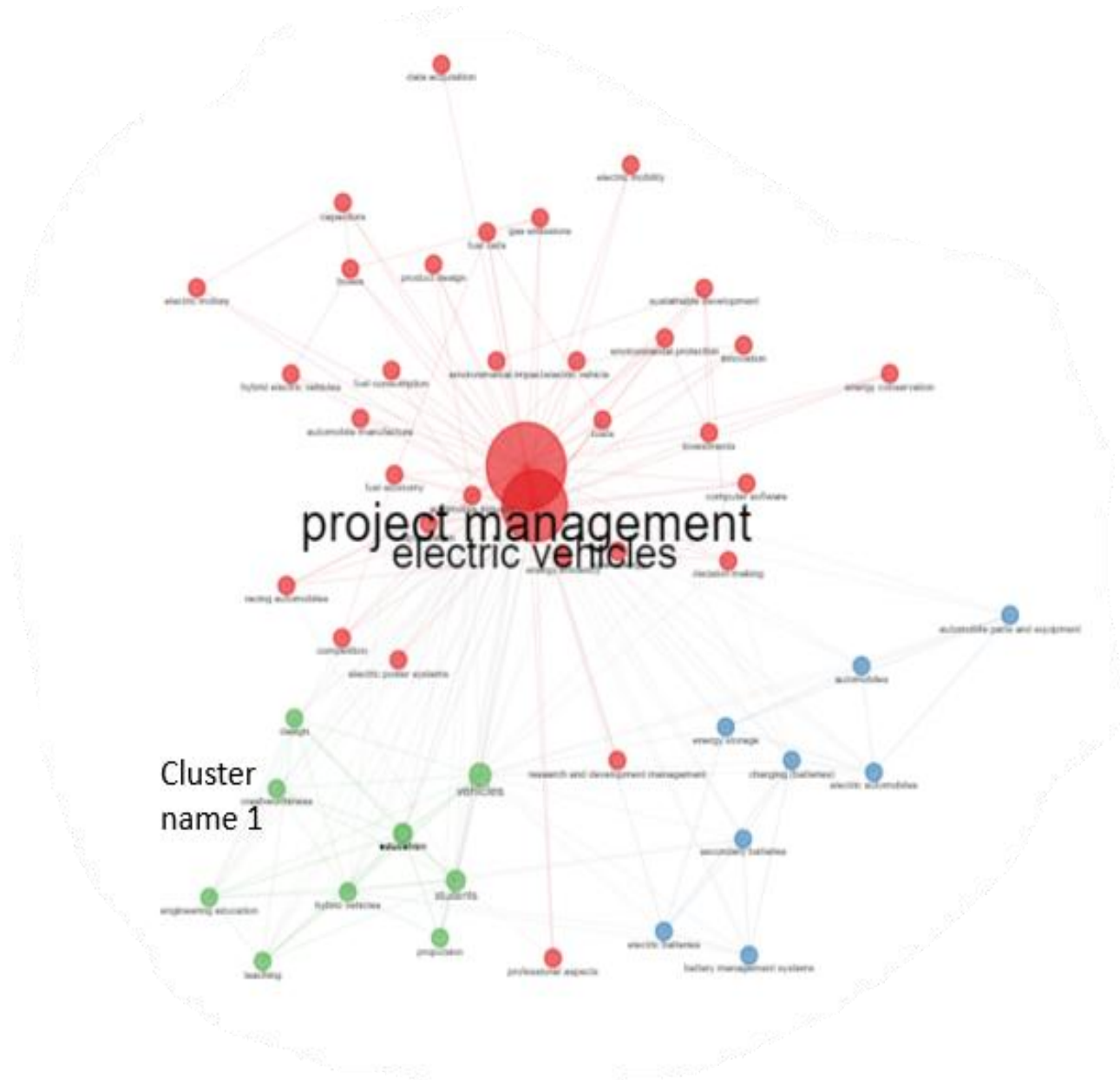
Figure 9: Co-occurrence Analysis of key words

CONCLUSION

In order to reach the conclusions listed below, this paper describes a bibliometric analysis of the term "Project Management" that was run through performance analysis and science mapping. 1. The four phases are divided into annual publication trends as follows: Precursor Phase (1993–2004); Growth Phase (2004–2008); Exponential Growth Phase (2009–

2018) (Maturity at FY 2018); Consolidation Phase (2019–2023). 2. By combining advanced digitalization and lean manufacturing with other management techniques, topic publishing can be improved. 3. Authors increasingly choose to publish their work in The International Journal of Production Research. Project management and the automotive industry's active participation in the field through single and multi-author publications have been their recent trends in the last three years. 5. When the pareto principle was used and national research production was examined

LIMITATIONS

The study's search was restricted to only articles that had been published in the Scopus database. Not all scholarly publications are included in Scopus. We do not take into account many other databases like Web of Science, Google Scholar, and Microsoft Academic. Only articles published in the engineering domain are taken into account during search criteria in the Scopus database, leaving out other science and finance journals.

SCOPE FOR FURTHER RESEARCH

Based on bibliometric analysis results, we can suggest a number of areas for additional study, including: 1. Create a framework for integrating Project Management with digitalization and the information revolution using cutting-edge methods like Internet of Things. 2. Industry-specific bibliometric analysis is necessary to determine current industry trends and predict future trends. 3. The network map used in this research to study PM tools does not show all of them. These 4. To help them benefit from this concept, country-specific research will be studied with international author collaboration.

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