Sustainable Solutions: Holistic Strategies For Electric Vehicle Adoption And Transportation Sustainability

Vinay Kumar[1], Yogita Sharma[2], Priyanka Chadha[3]

[1,2] School of Management and Commerce, Manav Rachna University, Faridabad, India.
[3] Amity Business School, Amity University, Noida, India.

Abstract

This research provides a thorough examination of marketing techniques in the electric vehicle (EV) business, utilizing several bibliometric indicators, trends in author productivity, and country-specific data. The data reveals an apparent rise in research focus and the influence of citations around the year 2020, followed by a subsequent decrease in future years. It also examines the specific effects of different sources, highlighting the significant influence of scholarly journals like the "Journal of Power Sources" and "Sustainability (Switzerland)" in shaping discussions around electric vehicle marketing. The analysis of commonly appearing terms and networks of word associations uncovers essential research topics like marketing tactics, sustainability, business trends, and consumer conduct. Our report provides useful insights into the changing landscape of EV market research and suggests future directions for both scholars and practitioners. Our goal is to provide a clear guide for understanding and navigating the complex world of EV marketing. We emphasize the importance of considering multiple disciplines and recommend comprehensive tactics to promote the adoption of EVs and develop sustainable transportation solutions.

Keywords: transportation, sustainability, bibliometric analysis, Holistic Strategies, Industry Influence

1. Introduction

The transportation industry significantly contributes to air pollution, especially in metropolitan regions, where the release of greenhouse gases (GHGs) is a leading cause of climate change. In order to address this issue, there has been an

increasing emphasis on electrifying road transportation as a fundamental approach to attain urban sustainability. Electric vehicles (EVs) have emerged as a viable answer, providing a more environmentally friendly alternative to conventional internal combustion vehicles.
Consumer preferences for electric cars (EVs) are shaped by a blend of symbolic, enviromental, economic, and pros stainability advantages.
Nevertheless, there is a dearth of research thoroughly examin es the wide array of issues linked to the adoption of electric v ehicles (EVs)and sustainable mobility. (Rajeev Ranjan Kumar, 2020)

In the current era, governments encounter crucial obstacles in guaranteeing energy security, mitigating climate change, improving urban air quality, and tackling human health concerns associated with air pollution. The transportation sector greatly worsens these difficulties, with a substantial contribution of almost 14% to global greenhouse gas emissions, as emphasized by the Intergovernmental Panel on Climate Change. In addition, the estimates from the World Health Organization highlight the significant consequences of urban air pollution, with almost 3 million fatalities and 85 million disability-adjusted life years linked to inadequate air quality.
Several approaches have been developed to evaluate the various aspects of sustainability. (Esteban Lopez-Arboleda 1, 2019)

The main objective of sustainability assessment is to thoroughly understand the impacts of a product, firm, sector, or system on three crucial dimensions: economic, environmental, and social domains. Due to the complex and interconnected structure of the transportation industry, attaining sustainability in this field requires navigating a network of interrelated factors. Decisions made to address problems in one area of the transportation system can unintentionally generate difficulties in other areas. Therefore, it is crucial to foresee the possible consequences of suggested solutions on both the transportation system itself and the wider range of sustainable performance indicators. (Muneer, 2017)

Prevailing global emphasis is on the development and promotion of cleaner and more efficient technologies for

passenger vehicles, with the aim of replacing conventional internal combustion engines. These engines not only consume large amounts of fossil fuels but also release enormous quantities of air pollutants, resulting in the deterioration of ecosystems and posing severe risks to human well-being. (Yang, 2022)

The increasing popularity of electric vehicles is due to their environmental benefits, since they help to alleviate global climate change, lower air pollution and its negative effects on people's health, and reduce reliance on fossil fuels and energy usage. These innovations tackle crucial obstacles in attaining sustainable transportation. (Adnan, 292-309)

Due to the increasing significance of sustainability in the auto motive sector, it is crucial to comprehensively analyze the vas t body of literature on marketing methods for promoting the use of sustainable transportation options, including electric ca rs (EVs).
The objective of our study is to fill the current gaps in researc h by creating a strong conceptual framework that combines i mportant elements in this area.

In order to fill these knowledge gaps, our objective is to examine the following research inquiries:

- What are the ways in which current obstacles impede the widespread use of electric vehicles, and how might marketing tactics help to reduce their impact?
- What are the dominant marketing methods used to promote the adoption of sustainable transportation solutions, particularly electric vehicles (EVs)?
- How has the literature on marketing strategies of electric vehicles (EVs) within the framework of sustainability progressed in terms of themes, trends, and research directions?

Using a scientometric methodology, this study aims to comprehensively assess and consolidate current literature on the marketing strategies of electric vehicles (EVs) from a sustainability standpoint. Our objective is to use scientometric methodologies to offer a thorough analysis of the main themes, trends, and research directions in this discipline.

This study investigates research issues by employing an integr ative literature technique that specifically examines marketin

g methods in the uptake of electric vehicles (EVs).
The review process discovers 115 Scopus papers that explore different facets of EV marketing and then combines their findi ngs.
This study provides substantial advancements in the realm of sustainable transportation, specifically focusing on marketing tactics for electric vehicles (EVs). (Bhatia, 2022)
The integrative framework methodically identifies patterns in publications, journals, and sources, utilizing a wide range of hi ghquality research and illustrating their interrelated linkages i n the field of sustainable transportation solutions.

Additionally, the paper provides an indepth analysis of import ant topics and concepts that arerelevant to electric vehicle (E V) marketing strategies, offering helpful perspectives on how topromote sustainable transportation options.In addition, by utilizing the study framework, we offer theoretical and manag erial suggestions to aid academics and politicians in understan ding the intricacies of marketing for electric vehicle (EV) adopt ion and directing future efforts towards sustainability.

2. Literature Review

This study utilizes a combination of life cycle sustainability assessment and multi-objective decision-making methods to illustrate how the results of sustainability assessments can be used to inform sustainable management practices and guide policies at the national level. Qatar is used as an example to demonstrate the use of this methodology. Four distinct technologies of sport utility vehicles (SUVs), specifically internal combustion vehicles (ICVs), hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and battery electric vehicles (BEVs), are evaluated based on 14 macro-level sustainability indicators. A global multiregional input-output analysis is employed to differentiate between the implications on supply chains at the regional and global levels. (Nuri Cihat Onat a, 2020)

This study examines the feasibility of electric vehicles (EVs) adopting a sustainable energy service business model in smart city environments by analysing existing literature and secondary data. The results emphasize the importance of electric vehicles (EVs) in promoting sustainability in the energy industry, specifically because they can efficiently store electricity generated from renewable sources utilizing EV batteries. This study's findings have important ramifications and offer recommendations for incorporating electric vehicles (EVs) into smart city frameworks. (Jnr, 2021)

The assessment highlights topics that have been comparatively overlooked in prior research, including dealership experience, charging infrastructure resilience, and marketing techniques. In addition, it identifies often researched subjects such as the development of charging infrastructure, the overall cost of owning a vehicle, and regulations that provide incentives for purchasing. (Almansour, 2022)The review further explains the mechanics of electric car adoption by emphasizing significant mediators and moderators. These findings provide useful insights for researchers and policymakers, addressing a gap in previous evaluations that did not thoroughly investigate all sustainable consequence variables at the same time. (Kumar, 2020)

Governments around the world are struggling to address the pressing needs of guaranteeing energy security, stopping climate change, and improving urban air quality. The transportation industry plays a pivotal role in these concerns, significantly exacerbating these urgent issues. Sustainable transport solutions seek to tackle these challenges by taking into account economic development, environmental conservation, and social advancement. Within this context, there has been a growing emphasis on shifting towards electric cars (EVs). Sustainable transportation is a complex system with interconnected components that interact through feedback loops. Effectively understanding and dealing with this complexity in a comprehensive and interconnected way poses a substantial problem that demands attention. (Gao, 2021)

3. Methodology

The PRISMA diagram is a flowchart that visually depicts the systematic method of doing a literature review, following the guidelines of the Preferred Reporting Items for Systematic

Reviews and Meta-Analyses. This document delineates the sequential actions undertaken throughout the evaluation procedure, starting from the first identification of pertinent research papers and concluding with the ultimate selection of articles to be included in the review. (Sopha, 2022)

- **Initial Search:** The process commenced with an initial search on the Scopus data platform using the terms "electric vehicle" and "sustainability". This platform is very suitable for bibliometric analysis since it encompasses a diverse array of indexed journals spanning several sectors of study.
- The search encompassed papers from 2010 to 2023, enabling a thorough review of documents over a substantial timeframe. The emphasis was placed on particular categories of documents, such as scholarly articles, conference papers, and evaluations.
- **Total Publications Identified:** The preliminary search returned a grand total of 200 publications that reference the term "electric vehicles marketing strategies."
- **Utilization of Inclusion Criteria**: The inclusion criteria were employed to further refine the selection of publications. This entailed exclusively examining conference papers, books, book chapters, review articles, and journal articles. After using these criteria, the total number of articles to be reviewed decreased to 180.
- **Exclusion of Specific terms:** To enhance the selection, some terms like "surveys," "cluster analysis," "behavioural research," etc., were eliminated.

After completing this phase, there were 142 items left.

- **Omission of Trade publications:** The screening procedure did not include trade publications, resulting in a decrease in the number of articles to 122.

The study was restricted to papers written in the English language in order to ensure uniformity and accessibility. As a result, the selection was reduced to 115 papers for evaluation and analysis. The PRISMA diagram offers a methodical summary of the systematic review process, detailing each stage involved in identifying and choosing pertinent publications for the study.

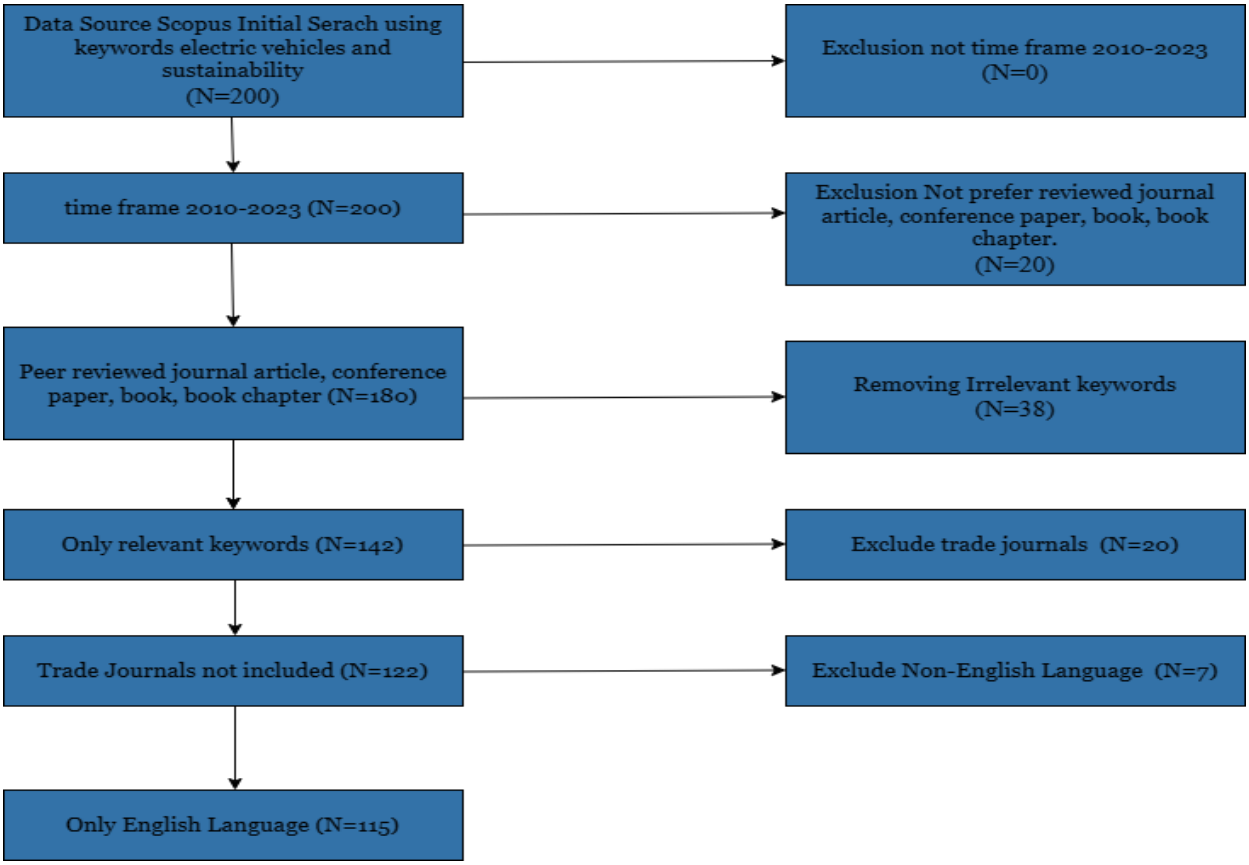

Figure 1: Data Extraction Using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Approach

4. Discussion of Results

4.1 Average Citation per Year

The data presented in Table 1 clearly demonstrate a substantial increase in both attention and citation effect within the field of EV marketing around the year 2020. However, in the following years, there was a decrease in both the quantity of published articles and their significance in terms of citations, as well as shorter durations of significant impact. This trend indicates the possibility of needing to reassess research directions and marketing methods in the electric vehicle (EV) field in order to revive interest and significance in academic and industry conversations. Additional investigation, encompassing a meticulous analysis of particular research subjects and the wider framework of the electric vehicle market, could yield more profound insights for a thorough comprehension of the changing environment.

Table 1: Average Citation per Year

Year	MeanTCperArt	N	MeanTCperYear	CitableYears
2015	32.33	6.00	3.59	9
2016	10.33	6.00	1.29	8
2017	20.56	9.00	2.94	7
2018	25.75	4.00	4.29	6
2019	24	3.00	4.80	5
2020	49.5	6.00	12.38	4
2021	13.5	14.00	4.50	3
2022	2.7	20.00	1.35	2
2023	0.25	8.00	0.25	1

4.2 Sources' Local Impact

Table 2 presents bibliometric measures for various sources relevant to research on marketing strategies for Electric Vehicles (EVs). Significantly, indicators such as the h-index, g-index, and m-index provide valuable information about the impact and productivity of publications. The "Journal of Power Sources" has a better h-index and total citations, showing that its articles have a significant influence. On the other hand, "Sustainability (Switzerland)" has a superior g-index and m-index, suggesting that its publications have a broader and more consistent impact. Academic publications including "Journal of Power Sources," "Sustainability (Switzerland)," and "Transportation Research Part D: Transport and Environment" have a significant impact, especially in the field of electric vehicle marketing research, as seen by their high h-indices and impact. Significantly, "Sustainability (Switzerland)" is notable for its strong g-index, which suggests a constant and substantial impact. In contrast, conference proceedings such as "2013 World Electric Vehicle Symposium and Exhibition, EVS 2014" and "24th International Battery, Hybrid and Fuel Cell Electric Vehicle Symposium and Exhibition 2009, EVS 24" provide an opportunity for the timely dissemination of research, even though they may have lower impact metrics. Academic journals such as "Journal of Power Sources," "International Journal of Hydrogen Energy," and "Journal of Cleaner Production" primarily concentrate on the scientific and engineering elements of electric vehicles (EVs), with a particular emphasis on the technological and environmental aspects. On the other hand, "Sustainability (Switzerland)" and "Energy Research and Social Science" take a broader approach

by integrating sustainability, social sciences, and environmental factors into their studies on electric vehicle marketing. The conference proceedings titled "2016 6th International Electric Drives Production Conference, EDPC 2016 - Proceedings" are designed for a practical audience in the industry, offering a range of disciplinary viewpoints. The presence of various disciplines in EV marketing emphasizes the complex and diverse character of this field, where technology, sustainability, and consumer behaviour meet. This highlights the significance of adopting a comprehensive approach to comprehend and promote EVs in the market.

The sources provided indicate a recent emphasis on marketing research related to electric vehicles (EVs), primarily starting from 2014. This trend reflects an increasing interest driven by environmental concerns and developments in technology. When researchers contribute to the growing knowledge of EV marketing, they should take into account the diverse effects and historical background of these sources.

Table 2: Sources' Local Impact

Element	h_index	g_index	m_index	TC	NP	PY_start
JOURNAL OF POWER SOURCES	3	3	0.12	1780	3	1999
SUSTAINABILITY (SWITZERLAND)	3	6	0.429	969	6	2017
ENERGY RESEARCH AND SOCIAL SCIENCE	2	2	0.286	228	2	2017
INTERNATIONAL JOURNAL OF HYDROGEN ENERGY	2	2	0.22	863	2	2014
JOURNAL OF CLEANER PRODUCTION	2	2	0.286	324	2	2017
TRANSPORTATION RESEARCH PART D: TRANSPORT AND ENVIRONMENT	2	2	0.33	410	2	2018
WORLD ELECTRIC VEHICLE JOURNAL	2	3	0.125	12	4	2008
2013 WORLD ELECTRIC VEHICLE SYMPOSIUM AND EXHIBITION, EVS 2014	1	1	0.1	5	1	2014

2016 6TH INTERNATIONAL ELECTRIC DRIVES PRODUCTION CONFERENCE, EDPC 2016 - PROCEEDINGS	1	1	0.125	1	1	2016
24TH INTERNATIONAL BATTERY, HYBRID AND FUEL CELL ELECTRIC VEHICLE SYMPOSIUM AND EXHIBITION 2009, EVS 24	1	1	0.067	1	2	2009

4.3 Authors Production Over Time

Table 3 presents a thorough summary of the frequency at which different authors in the Electric Vehicles (EVs) marketing sector publish their work and the influence of their citations. Notable authors like FRIEDRICH HE and HARDMAN S have made significant contributions through their impacting publications, as indicated by their high total citations (TC) and citations per year (TCpY) numbers. In contrast, authors such as KASPER RJ and KUHN M have not gotten much recognition, as evidenced by the lower number of citations or the absence of citations altogether.

The presence of significant increases in citation impact, specifically noticed during specific years for writers such as LI L and KEMPTON W, highlight periods of heightened recognition for their contributions.

EV marketing research covers a wide range of subjects, such as analyzing consumer behavior, studying cultural acceptance of EVs, examining sustainability factors, and exploring grid integration. There is a clear trend towards conducting research that focuses on consumers, emphasizing the significance of comprehending customer viewpoints, motives, and actions when it comes to adopting electric vehicles. This is in line with the growing emphasis on sustainability and environmental impact research, which reflects worldwide initiatives to encourage environmentally friendly transportation.

Furthermore, the increasing importance of grid integration and energy management highlights the changing nature of transportation electrification, requiring the need for effective charging infrastructure. Market analysis and business strategy research are crucial for providing valuable insights into the competitive dynamics and market growth possibilities for electric vehicle (EV) producers and stakeholders.

The interdisciplinary nature of EV marketing research is seen in the wide range of academic sources, encompassing fields such as sustainability, marketing science, and energy policy. Research effect may differ among different sources, but articles that investigate developing issues such as vehicle-to-grid (V2G) technology or market prospects tend to attract more attention because of their practical significance for the evolving electric vehicle (EV) industry.

Table 3: Authors' Production over Time

Author	year	freq	TC	TCpY
ARGUE C	2016	2	1	0.125
FRIEDRICH HE	2010	2	20	1.429
HARDMAN S	2015	1	40	4.444
HARDMAN S	2022	1	2	1
HOU E	2016	2	1	0.125
KASPER RJ	2005	1	0	0
KASPER RJ	2006	1	0	0
KEMPTON W	2000	1	194	8.083
KEMPTON W	2005	1	1664	87.579
KETSMUR V	2021	2	4	1.333
KUHN M	2017	1	0	0
KUHN M	2022	1	0	0
LI L	2021	2	86	28.667
LIU X	2016	1	16	2
LIU X	2023	1	0	0

4.4 Most Relevant Countries

Table 4 highlights key insights about countries in relation to the marketing strategy of Electric Vehicles (EVs). China, with a notable frequency of 69, leads in research activity, reflecting its global prominence as both a manufacturer and market for EVs. The USA, Germany, and the UK follow closely, indicating their significant contributions to the EV industry, with Germany's strong automotive sector being a pivotal factor. India's growing presence with 20 publications suggests emerging interest in EVs, likely driven by its expanding middle class and environmental concerns. Italy, Canada, and Malaysia demonstrate noteworthy engagement, while France and Indonesia also participate, albeit to a lesser extent. Economically advanced countries like the USA, Germany, and the UK take the lead in research activity, driven by established automotive industries and higher consumer purchasing power. Conversely, emerging economies like India and Indonesia show a growing interest in EVs but have a lower research frequency,

reflecting their evolving status in the EV market. This division aligns with the global North-South distinction, where developed nations in the global North play a dominant role while countries in the global South are gradually catching up. Furthermore, regional agreements, such as those within the European Union or ASEAN, influence research patterns and marketing strategies, emphasizing the importance of regional dynamics in shaping the future of EV marketing on a global scale. The analysis of corresponding authors' countries in Electric Vehicles (EVs) marketing research (Table 5) provides valuable insights into the global landscape of this field. China emerges as a prominent contributor with 19 articles and a notable MCP (Multiple Corresponding Authors) ratio, indicating active collaboration among researchers within the country. Germany and the USA follow closely, each with 11 articles and a substantial MCP ratio, highlighting their influential roles in shaping research in the EV marketing domain. India, despite its high article count, shows a lower MCP ratio, suggesting that research in the country may be more individually driven. The United Kingdom, Canada, and Switzerland exhibit varying levels of research activity and MCP participation, underscoring their roles as emerging contributors. Italy demonstrates a balanced MCP ratio with limited research activity. Prominent research contributors in the global North, such as Germany, the USA, and the United Kingdom, exhibit robust collaboration and research activity, driven by well-established automotive industries and strong environmental policies. In contrast, developing economies like India and Indonesia are in the early stages of research, marked by individualized efforts and lower collaborative ratios, indicating their evolving roles in the global EV market.

Table 4: Corresponding Author's Countries

Country	Articles	SCP	MCP	Freq	Creation
	35	**32**	**3**	**0.304**	**0.086**
CHINA	19	16	3	0.165	0.158
GERMANY	11	9	2	0.096	0.182
USA	11	9	2	0.096	0.182
INDIA	7	7	0	0.061	0
UNITED KINGDOM	5	4	1	0.043	0.2
CANADA	3	1	2	0.026	0.667
INDONESIA	3	3	0	0.026	0
SWITZERLAND	3	3	0	0.026	0
ITALY	2	1	1	0.017	0.5

4.5 Most Frequent Words

The analysis of frequently occurring words in research articles related to the marketing strategy of Electric Vehicles (EVs), Table 5, reveals several main themes. "Marketing" stands out as the central theme, emphasizing the focus on promoting and selling EVs effectively. "Electric vehicles" and "electric vehicle" reflect the core subject matter, highlighting the primary object of study. "Commerce" and "sales" indicate a strong emphasis on the commercial aspects of EVs, including distribution and purchase trends. The keyword “sustainable development" underscores the increasing importance of sustainability and environmental concerns in EV marketing research. "Automobile manufacture" points to a focus on the manufacturing processes and strategies in the EV industry. Lastly, "consumption behavior" suggests a keen interest in understanding consumer preferences and behaviors related to EV adoption. These recurring words collectively outline the primary themes explored in EV marketing research, encompassing marketing strategies, sustainability, consumer behavior, and the commercialization of electric vehicles.

Table 5: Most Frequent Words

Words	Occurrences
Marketing	42
electric vehicles	35
commerce	33
electric vehicle	18
Sales	16
automobiles	12
marketing strategy	12
sustainable development	12
automobile manufacture	11
consumption behavior	11

4.6 Co-occurrence Network

The provided network analysis (Table 6) presents the centrality measures of various terms within the context of Electric Vehicles (EVs) marketing research. "Marketing" and "electric vehicles" emerge as highly central nodes, indicating their pivotal roles in the research network. "Marketing strategy" and "fuel cells" are also influential, though to a lesser extent. These terms likely represent core concepts and areas of focus in the field of EV marketing. Additionally, terms like "vehicles," "energy utilization," "electric automobiles," "electric power transmission networks," "energy efficiency," and "charging

(batteries)" contribute to the overall network but exhibit lower centrality. This suggests that they play complementary roles in shaping the discourse of EV marketing research, potentially representing subtopics or supporting concepts. Overall, this network analysis offers insights into the key themes and central concepts within the research on EV marketing strategy, providing a structural overview of the field's methodology and key findings.

Table 6: Co-occurrence Network

Node	Cluster	Betweenness	Closeness	PageRank
marketing	1	395.87 98337	0.0188 67925	0.1164 25745
electric vehicles	1	361.50 15926	0.0188 67925	0.1144 50198
marketing strategy	1	1.4128 28139	0.0113 63636	0.0258 68293
fuel cells	1	2.0862 80207	0.0113 63636	0.0217 74611
Vehicles	1	1.6785 85323	0.0112 35955	0.0193 80851
energy utilization	1	1.1598 99141	0.0108 69565	0.0121 32361
electric automobiles	1	0.8062 92292	0.0109 89011	0.0127 76963
electric power transmission networks	1	0.5	0.0108 69565	0.0136 97793
energy efficiency	1	0.5053 63762	0.0108 69565	0.0115 86303
charging (batteries)	1	0.1192 15686	0.0107 52688	0.0091 72142

4.7 Co Occurrence (All Keywords)

The methodology used for this analysis involves keyword co-occurrence analysis to identify relationships between terms frequently found together in research articles. Minimum number of occurrences of keyword was taken as 5. Out of the 986 keywords, 30 met the threshold. The findings reveal distinct thematic clusters, showcasing the multifaceted nature of EV marketing research, spanning marketing strategies, sustainability, industry dynamics, policy, and consumer behaviour. (Table 7).

Red Cluster (Main Research Themes): This cluster appears to represent the primary research themes in EV marketing. It includes terms related to electric vehicles (EVs), energy efficiency, marketing, marketing strategy, and sustainable development. Researchers in this cluster likely explore the marketing strategies and sustainability aspects of EVs, analyzing consumer behavior, and considering energy-efficient technologies like fuel cells. Within this cluster, there is a clear dominance of two core themes - "electric vehicles" and "marketing." Researchers are intensively focused on EVs, reflecting the industry's shift toward electrification. The prominence of "marketing" underscores the crucial role of marketing strategies in driving EV adoption. Additionally, the inclusion of "sustainable development" and "energy efficiency" highlights a growing trend towards incorporating sustainability and energy-efficient technologies in EV marketing strategies. Researchers are recognizing the importance of aligning EV promotion with environmental concerns and technological advancements.

Green Cluster (Automobile Industry Focus): This cluster appears to be centered around the automobile manufacturing industry. It includes terms related to automobile manufacture, the automotive industry, battery electric vehicles, and commerce. Research in this cluster may delve into the production and commerce of electric vehicles, including manufacturing processes and industry dynamics. The green cluster is characterized by an emphasis on the transformation of the traditional automobile industry due to the emergence of EVs. "Automobile manufacture" and "automotive industry" signify this industry evolution, reflecting research into how established manufacturers adapt to EV production. "Battery electric vehicles" being a dominant theme reflects the industry's shift towards battery-powered EVs, while "commerce" points to a growing interest in the commercialization of EVs, including sales strategies and business models.

Blue Cluster (Policy and Sustainability): The blue cluster revolves around public policy, sustainability, and consumer behavior. It includes terms like consumer behavior, education, public policy, and sustainability. Researchers in this cluster have examined the impact of policies on EV adoption, consumer behaviors, and education campaigns promoting sustainable transportation. the primary trend is a consumer-

centric approach. "Consumer behavior" is at the forefront, indicating a strong focus on understanding consumer preferences and decision-making processes in EV adoption. Concurrently, "public policy" highlights the influence of government regulations, incentives, and policies on the EV market. Researchers are examining the intricate relationship between policy decisions and market dynamics. "Sustainability" remains a consistent theme, reflecting the ongoing commitment to align EV marketing with sustainability goals and environmental considerations.

Yellow Cluster (Regional and Consumer Focus): This cluster appears to have a regional and consumer-centric focus. It includes terms like China, electric vehicle, purchase intention, purchasing, and sales. Researchers in this cluster may concentrate on understanding the Chinese EV market, consumer preferences, purchase intentions, and sales trends. The yellow cluster prominently features "China" as a dominant theme, underscoring the pivotal role of China in the global EV market. Researchers are likely delving into the unique dynamics and challenges of the Chinese EV market. Additionally, consumer-centric themes like "consumer preferences," "purchase intention," and "sales" indicate a regional and consumer-focused research approach. Researchers are keen on exploring how regional variations in consumer behavior impact EV adoption and sales.

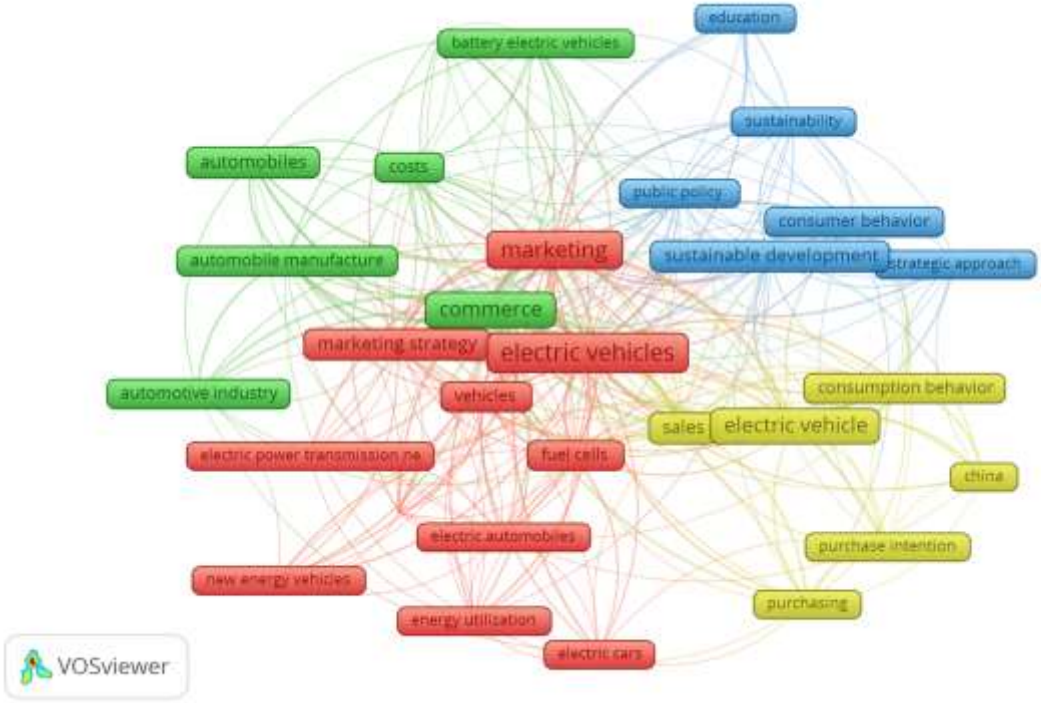

Figure 2: Authors keywords Co Occurrence Analysis

Table 7: Authors Keywords Co Occurrence Analysis

Cluster	Keyword
Red	• electric automobiles • electric cars • electric power transmission networks • electric vehicles • energy efficiency • energy utilization • fuel cells • marketing • marketing strategy • new energy vehicles • vehicles
Green	• automobile manufacture • automobiles • automotive industry • battery electric vehicles • charging (batteries)
Blue	• commerce • costs • consumer behavior • education • public policy • strategic approach

Yellow	• sustainability • sustainable development • China • consumption behavior • electric vehicle • purchase intention • purchasing • sales

5. Conclusion

To summarize, the examination of marketing research on Electric Vehicles (EVs) uncovers noteworthy patterns and prospects for promoting sustainable transportation alternatives. The growing focus on consumer-centric research highlights the significance of comprehending customer behaviours and preferences in influencing the adoption of electric vehicles (EVs). Furthermore, the increasing emphasis on sustainability and environmental effect mirrors worldwide endeavours to decrease carbon emissions and advocate for more environmentally friendly transportation options.

The key findings indicate that in order to overcome problems and take advantage of growing opportunities in the electric vehicle (EV) sector, there is a need for collaboration between different disciplines and the use of new ideas. In order to promote the adoption of electric vehicles and develop sustainable transportation ecosystems, it is crucial to integrate emerging technology, improve consumer insights, and encourage collaborative policy initiatives.

In order to expedite the shift towards electric mobility, it is imperative that research focuses on circular economy strategies, urban mobility solutions, and collaborations across different sectors. By focusing on these specific areas, researchers and practitioners can actively contribute to the creation of all-encompassing policies that encourage the adoption of electric vehicles, minimize environmental harm, and further the objectives of sustainable mobility.

6. Future Research Directions

- Examine the use of cutting-edge technologies, such as artificial intelligence (AI) and Internet of Things (IoT), into electric vehicle (EV) marketing strategies. Examine the ways in which these technologies might improve customer involvement, optimize the infrastructure for charging electric vehicles, and customize marketing strategies to encourage the adoption of electric vehicles.

- Advanced analytics and behavioral research are used to deepen understanding of customer preferences, motives, and barriers to electric vehicle (EV) adoption, resulting in enhanced consumer insights. Identify efficient communication tactics to tackle consumer complaints, enhance awareness, and impact purchasing decisions.
- Analyze the influence of collaborative policy initiatives including governments, industry stakeholders, and research institutions on the expansion of the electric vehicle market. Analyze the efficacy of incentives, subsidies, and regulatory frameworks in stimulating the adoption of electric vehicles and cultivating sustainable transportation environments.
- Examine the ideas of circular economy in the manufacturing, distribution, and administration of electric vehicles (EVs). Conduct a thorough examination of possibilities to recycle materials, prolong the lifespan of products, and reduce the environmental footprint at every stage of the electric vehicle's life cycle.
- Examine cutting-edge urban mobility alternatives, including shared electric mobility services and micro-mobility options, in their role of advancing sustainable transportation in metropolitan environments. Analyze the significance of electric vehicles (EVs) in the context of integrated multimodal transportation systems and smart city projects.

References

1. Adnan, N. N. (292-309). An overview of electric vehicle technology: a vision towards sustainable transportation. Intelligent transportation and planning: breakthroughs in research and practice.
2. Almansour, M. (2022). Electric vehicles (EV) and sustainability: Consumer response to twin transition, the role of e-businesses and digital marketing. Technology in Society.
3. Bhatia, A. R. (2022). A review of tourism sustainability in the era of Covid-19. ournal of Statistics and Management Systems, 25(8), 1871-1888.
4. Esteban Lopez-Arboleda 1, A. T. (2019). Systematic Review of Integrated Sustainable Transportation Models for Electric Passenger Vehicle Diffusion. Systematic review of integrated sustainable transportation models for electric passenger vehicle diffusion. Sustainability.
5. Gao, Y. Z. (2021). Implementation and evaluation of a practical electrochemical-thermal model of lithium-ion batteries for EV battery management system. Energy.
6. Jnr, B. A. (2021). Integrating Electric Vehicles to Achieve Sustainable Energy as a Service Business Model in Smart Cities. Frontiers in sustainable cities, 3.

7. Kumar, R. R. (2020). Adoption of electric vehicle: A literature review and prospects for sustainability. Journal of Cleaner Production, 253.
8. Muneer, T. K. (2017). Electric vehicles: prospects and challenges.
9. Nuri Cihat Onat a, N. N. (2020). From sustainability assessment to sustainability management for policy development: The case for electric vehicles. Energy Conversion and Management, 216.
10. Rajeev Ranjan Kumar, K. A. (2020). Adoption of electric vehicle: A literature review and prospects for sustainability. Journal of Cleaner Production, 253.
11. Sopha, B. M. (2022). Barriers and enablers of circular economy implementation for electric-vehicle batteries: from systematic literature review to conceptual framework. Sustainability, 14(10).
12. Yang, Z. H. (2022). ustainable electric vehicle batteries for a sustainable world: perspectives on battery cathodes, environment, supply chain, manufacturing, life cycle, and policy. Advanced Energy Materials, 12(26).
13. Rastogi, A., Pati, S. P., Krishnan, T. N., & Krishnan, S. (2018). Causes, contingencies, and consequences of disengagement at work: An integrative literature review. Human Resource Development Review, 17(1), 62-94.
14. Morgan, D. J., Brownlee, S., Leppin, A. L., Kressin, N., Dhruva, S. S., Levin, L., ... & Elshaug, A. G. (2015). Setting a research agenda for medical overuse. Bmj, 351.
15. Pautasso, M. (2013). Ten simple rules for writing a literature review. PLoS computational biology, 9(7), e1003149.
16. Seuring, S., & Gold, S. (2012). Conducting content-analysis based literature reviews in supply chain management. Supply Chain Management: An International Journal, 17(5), 544-555.