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Emerging Trends in Sustainable Entrepreneurial Behaviour: Bibliometric Data Insights

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Abstract: The present study explores the current trends in sustainable entrepreneurial behavior to contribute fundamental knowledge for future academic research in the dynamic field of sustainable entrepreneurship. This study employs a bibliometric analysis using the Scopus database to identify significant changes and emerging topics in academic discourse about the selected keywords. By employing a systematic approach, one can attain a comprehensive understanding of the subject matter and establish a solid foundation for subsequent research. The analysis comprises a total of 666 articles obtained from Scopus. This study utilizes methodological tools like Microsoft Excel, Harzing's Publish or Perish program, and VOS viewer. These tools were used to quantify and evaluate citation frequencies. This method enables the assessment of the academic output and influence exerted by document type, evolution of published studies, subject area, and prominent keywords. Nevertheless, there are several constraints associated with this study, including the omission of articles published after 2022 and a specific emphasis on English-language publications from 1991 to 2022. Notwithstanding these limitations, there has been a substantial and continuous academic emphasis on the study of sustainable entrepreneurial behavior. Future research should investigate sustainable behavior within the context of social entrepreneurship. The government and policymakers have the ability to significantly contribute to the creation of an ecosystem that promotes sustainable entrepreneurship and sustainable development.

Keywords: *Sustainability, entrepreneurial behavior, bibliometric analysis, VOS viewer.*

1. Introduction

The Sustainable Development Goals (SDGs) play a paramount role in shaping global economic development in the 21st century. The acknowledgment of the SDGs as a central aspect of economic development underscores a paradigmatic shift towards a more comprehensive, environmentally aware, and socially accountable approach to economic growth. In the face of urgent global concerns like climate change, resource depletion, and social inequality, the need for entrepreneurship to address these challenges becomes crucial. The transformative agenda now places great importance on sustainable entrepreneurial behavior, which involves a strong commitment to environmental and social responsibility, ethical practices, and resource-efficient operations. The increasing awareness of social and environmental sustainability has precipitated the emergence of sustainable entrepreneurship as a central topic of research. The increased focus on societal and ecological concerns led to a significant interest in academic research on how entrepreneurial activities might align with sustainability imperatives. This discipline aims to elucidate how entrepreneurial endeavors can be harmonized with sustainability principles, encompassing the judicious utilization of resources, ethical business practices, and a conscientious assessment of social and environmental impacts. Conventional business models, which prioritize profit, encounter challenges in reconciling economic objectives with environmental and social responsibility.

Therefore, it is imperative to cultivate and encourage sustainable entrepreneurial behavior that aligns with the principles of sustainable development. This demonstrates an awareness of the interdependence between economic progress and the broader objectives of environmental stewardship and social equity, emphasizing the role of entrepreneurs in promoting sustainable and responsible global economic development. Entrepreneurs can utilize the combined knowledge and viewpoints of suppliers, consumers, and local communities to discover significant prospects and collaboratively design solutions that align with the multifaceted principles of sustainable development (Yang et al., 2022). Disseminating awareness regarding the critical nexus between sustainable development and entrepreneurship is integral to inspiring and mobilizing individuals to participate in sustainable entrepreneurship. Understanding the interplay between sustainable development and entrepreneurship can serve as a catalyst for increased participation in sustainable business initiatives (Hoogendoorn et al., 2019). Thus, the impetus for this study arises from the conviction that sustainable entrepreneurial behavior is not merely an ethical choice but also a strategic imperative for businesses in the 21st century. Entrepreneurs have the capacity to address environmental and social challenges creatively and flexibly, offering a distinct opportunity to confront these difficulties.

Understanding the landscape of sustainable entrepreneurial behavior research through bibliometric analysis is crucial for identifying key research themes, influential scholars, and potential avenues for future exploration. Bibliometric analysis, a quantitative approach that examines patterns in academic literature, is instrumental in identifying emerging trends, key contributors, and critical research gaps within a specific discipline (Li et al., 2022). It provides a systematic and unbiased method for tracking the trajectory of knowledge dissemination and the evolution of research themes. However, despite the burgeoning interest in the convergence of entrepreneurship and sustainability, there is still limited research in this specific domain. While extant literature has explored various facets of sustainable entrepreneurship, there is a notable gap in consolidating and synthesizing this knowledge to offer a comprehensive understanding of emerging trends. This study aims to address this gap by employing bibliometric analysis to distill insights from a broad array of scholarly publications, providing a holistic perspective on the evolution of sustainable entrepreneurial behavior research. The remainder of this article reviews the relevant literature on sustainable entrepreneurship and the methodology employed for the bibliometric analysis. Subsequently, the article proceeds to discuss the findings and insights derived from the analysis, the study's implications, and avenues for future research. The conclusion provides a concise overview of the main points and underscores the significance of understanding emerging trends in sustainable entrepreneurial behavior for both academia and practical applications.

2. Literature Review

Entrepreneurs exert considerable influence in steering businesses towards sustainability. Sustainable entrepreneurship is characterized by a proactive approach that involves creating novel sustainable enterprises and conscientiously transforming existing ones to make them more sustainable. This multifaceted engagement entails not only starting environmentally and socially conscious businesses but also continuously scrutinizing and refining existing ventures to better conform to sustainable principles. Entrepreneurs' collective endeavors have a crucial role in promoting a comprehensive and enduring commitment to sustainable business practices (Sreenivasan & Suresh, 2023). Entrepreneurs must manage interconnected aspects such as resource utilization, social equity, and ecological impact to establish a well-rounded commitment to sustainability. The sustainable entrepreneurship framework encapsulates the strategic decisions and operational pursuits undertaken by sustainable entrepreneurs. It serves as a conceptual structure that outlines the orchestrated efforts of these entrepreneurs to harmonies their business models with the imperatives of sustainability.

By doing so, entrepreneurs aspire not only to achieve business success but also to contribute meaningfully to the broader goals of sustainability, demonstrating a conscientious and forward-thinking approach to entrepreneurial endeavors. Furthermore, a study conducted by (Peng et al., 2021) revealed a positive correlation between environmental values and the inclination to participate in sustainable entrepreneurship. Factors like experience, attitude, societal norms, and self-efficacy have an impact on the relationship between environmental values and sustainable entrepreneurial intention. Furthermore, there is a positive correlation between environmental values and the inclination to establish a sustainable company among entrepreneurs who have limited expertise, as opposed to their counterparts with extensive experience. Entrepreneurs must possess an understanding of the complex nature of sustainable development and acknowledge the necessity of regularly evaluating sustainable development-related aspects (Manshor & Saad, 2023). Sustainable entrepreneurial behavior, a burgeoning field within entrepreneurship studies, is characterized by a dual commitment to economic prosperity and ecological and social responsibility.

Empirical investigations into sustainable entrepreneurial behavior encompass a spectrum of research methodologies. The academic discourse surrounding this phenomenon, which incorporates diverse theoretical underpinnings and methodological approaches, enhances the increasing comprehension of the intricate dynamics between sustainability and entrepreneurs' behavior. The Theory of Planned Behavior (TPB), formulated by Ajzen (1991) offers a conceptual framework for understanding and predicting human behavior, specifically within the realm of intentional acts. According to this theoretical framework, it is proposed that an individual's intention to partake in a particular behavior is a key factor in determining the probability of that behavior being manifested. The intention is shaped by three primary determinants: the individual's disposition towards the behavior, subjective norms, and perceived behavioral control. A study by (Ndofirepi, 2023) revealed that the variable of attitude toward behavior had a statistically significant direct impact on sustainable entrepreneurial

intention, which was mediated by attitude towards behavior. Subsequent analysis revealed that subjective norms are one of the three components of the Theory of Planned Behavior (TPB).

Do not have a substantial impact as an antecedent for sustainable entrepreneurial intention. External variables, such as education and family support, exerted a substantial influence on the development of favorable attitudes. Notably, there was no substantial correlation between education, social support, and perceived behavior control. The study by Truong et al., (2022) revealed that perceived behavior control is the primary factor influencing the intention to initiate sustainable entrepreneurship (SE), closely followed by persona attitude. According to Thelken & de Jong (2020) attitudes and perceived behavioral control have a substantial impact on individuals' aspirations to become sustainable entrepreneurs. Therefore, possessing a positive mindset towards sustainability and seeing a sense of agency over one's actions in that context are key factors that motivate the inclination to engage in sustainable entrepreneurship (Yasir et al., 2021) posited that attitudes, perceived behaviors, and social norms collectively affect aspirations to engage in sustainable entrepreneurship. Romero-Colmenares & Reyes-Rodríguez (2022) revealed in their study that a number of factors, such as individuals' perceptions of such ventures, perceived difficulty, and adherence to subjective norms, have an impact on how they feel about starting sustainable enterprises. Moreover, the aforementioned aspects are shown to be positively influenced by the presence of altruistic values inside individuals, education for sustainable entrepreneurship, and their belief in attaining desired objectives.

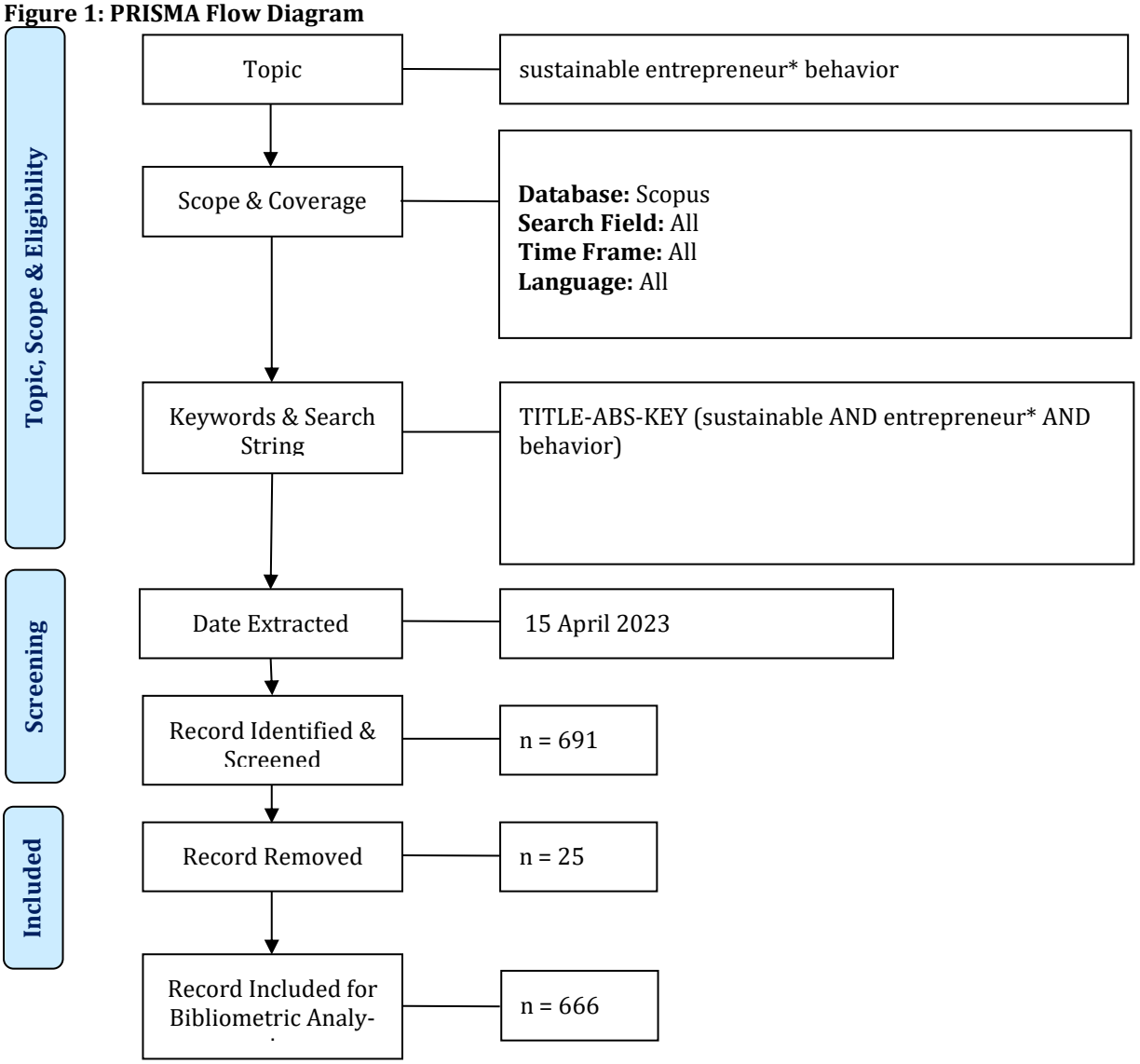
Vuorio et al., (2018) discovered that individuals' views on sustainability and their assessment of the importance of engaging in entrepreneurial activities influence the development of sustainable entrepreneurial intents. Altruism and extrinsic rewards are the driving forces behind the aforementioned attitudes, with extrinsic rewards notably exerting a contrasting influence on both drivers of sustainability-oriented entrepreneurial aspirations. The convergence of education and entrepreneurship has garnered considerable interest in recent years, particularly within the framework of sustainable development. Education is essential for providing entrepreneurs with the necessary knowledge, skills, and mindset to integrate sustainable practices into their ventures. A curriculum that emphasizes the principles of sustainable development, environmental stewardship, and social responsibility provides aspiring entrepreneurs with a holistic understanding of the interconnectedness between business and broader social and environmental contexts. Experiential learning and practical exposure are crucial in shaping sustainable entrepreneurs, going beyond the confines of conventional classroom settings. Internships, mentorship programs, and partnerships with sustainable businesses provide learners with practical experience and insights into the daily challenges of integrating sustainability into entrepreneurial ventures. These experiences cultivate a profound understanding of the pragmatic elements of sustainable business. Thus, it is imperative to adopt sustainable entrepreneurial behavior to attain a sustainable economy and effectively address environmental and social concerns.

Entrepreneurs must prioritize the integration of sustainability and social responsibility into their business practices to ensure long-lasting benefits for all stakeholders. Yang et al. (2022) discovered that the institutional environment substantial and positive influence on sustainable entrepreneurial behavior. Ultimately, the combination of a dedication to economic growth and a sense of accountability towards the environment and society is propelling the advancement of sustainable entrepreneurship as a significant influence in the modern business landscape. As entrepreneurs engage in this multifaceted journey, they navigate intricate terrain, seeking to harmonies ecological, social, and economic dimensions in decision-making processes. It is evident that various factors, including attitudes, perceived behavior control, social norms, and environmental values, play significant roles in shaping sustainable entrepreneurial intentions. Empirical research continues to illuminate the interconnectedness of sustainable entrepreneurship and the broader context of sustainability, underscoring the need for ongoing exploration in this dynamic field. Entrepreneurs must prioritize sustainability and responsibility in their business practices to create long-lasting value for all stakeholders, guided by an understanding of the intricate dynamics that motivate sustainable entrepreneurial behavior. Therefore, it is imperative to utilize bibliometric analysis to examine the dynamic field of sustainable entrepreneurial behavior. This approach is crucial for obtaining a thorough understanding of developing patterns, influential researchers, and promising avenues for further investigation in this critical domain.

3. Methods

This study employed data from the SCOPUS database. The selection of this database was based on its reputation as a comprehensive and esteemed repository of scholarly articles and research publications, encompassing a wide spectrum of academic disciplines. The meticulous curation and indexing processes ensure that it is a reliable and trustworthy source for academic research.

Figure 1: PRISMA Flow Diagram



Source: (Zakaria et al., 2021).

The specific date of 15 April 2023 was chosen strategically to ensure a balanced and comprehensive representation of available academic literature as reported in Figure 1. By selecting a cut-off date, we aimed to provide an accurate snapshot of the scholarly landscape up to that point in time, while excluding articles from the ongoing year to mitigate potential bias. This methodology allowed us to work with a dataset that was well-vetted and had undergone extensive quality control. The search was conducted using relevant keywords including "sustainable entrepreneur* behavior." Limited to articles containing these terms in the title, abstract and keywords. The resulting search yielded 691 articles for bibliometric analysis. However, 2023 articles were excluded from this study resulting in 666 articles available for analysis. A total of 25 articles were removed because of using other languages. To conduct the analysis, several tools were employed. First,

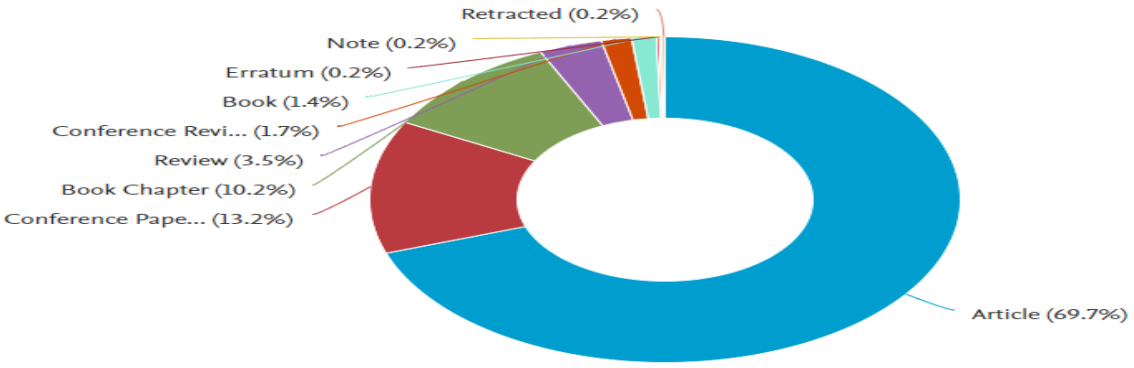
Microsoft Excel was used to calculate the frequency of published materials and generate relevant charts and graphs. Second, Harzing's Publish or Perish software was used to calculate citation metrics and other relevant frequencies. Finally, a VOS viewer was used to construct and visualize bibliometric networks.

4. Results

The present study examines the bibliometric attributes of the literature on sustainable entrepreneurial behavior, drawing upon data obtained from the Scopus database. Specifically, researchers focus on analyzing several aspects, such as document and source types, publishing trends over time, language, source titles, country productivity, authorship, text content, and citation analysis. The findings were presented primarily in the form of frequency and percentage distributions. To map the co-occurrence of author keywords, researchers employ the VOS viewer software. Furthermore, the researcher's citation metrics and identifies the 20 publications with the highest number of citations from the Scopus database.

Document and Source Types: This study examines the documents obtained from the Scopus database, specifically analyzing the document type and source type. The document types covered in this analysis encompass journal articles, conference papers, book chapters, reviews, conference reviews, books, erratums, notes, and retracted. Figure 2 presents the distribution of document types.

Figure 2: Document Type Chart



Sources: Developed by the authors using Scopus Tools.

Table 1 displays the comprehensive distribution of publications across various document types within the analyzed domain. The data clearly indicates that the majority, specifically 464 publications, or 69.7%, are journal articles. Furthermore, conference papers represent a noteworthy portion, comprising publications, corresponding to 13.2%. Moreover, book chapters contribute to 10.2% of the total. The remaining categories collectively account for less than 10% of the overall publications, underscoring the relatively insignificant role of these alternative forms of scholarly dissemination in the specified field.

Table 1: Document Type

Document Type	Total Publications (TP)	Percentage (%)
Article	464	69.7
Conference Paper	88	13.2
Book Chapter	68	10.2
Review	23	3.5
Conference Review	11	1.7
Book	9	1.4
Erratum	1	0.2
Note	1	0.2
Retracted	1	0.2
Total	**666**	**100.0**

Sources: Developed by the authors using Scopus Tools.

This study has also defined categories of source types. Table 2 reveals a prominent trend, indicating that the predominant medium for disseminating articles is journals rather than conference proceedings and other sources. Journal articles account for the largest proportion, with 490 (73.6%) publications in Scopus index journals.

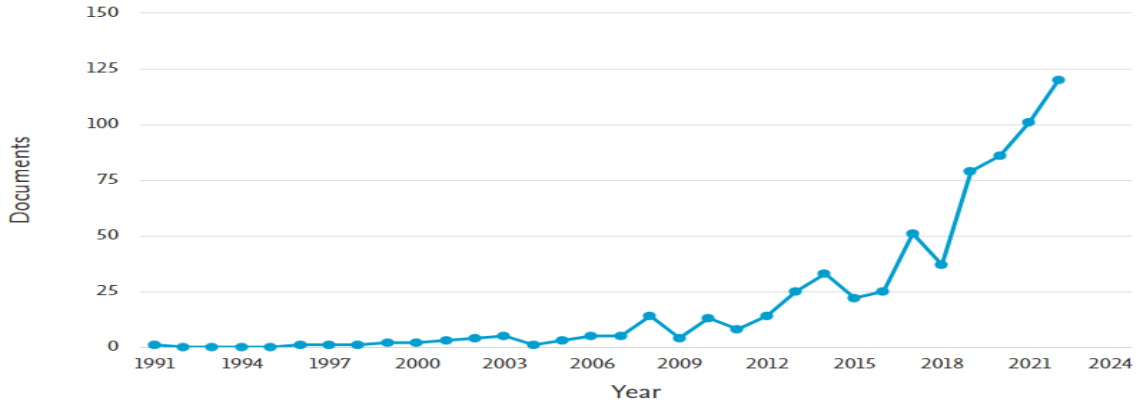
Table 2: Source Type

Source Type	Total Publications (TP)	Percentage (%)
Journal	490	73.6
Conference Proceeding	81	12.2
Book	51	7.7
Book Series	42	6.3
Trade Journal	2	0.3
Total	**666**	**100.00**

Sources: Developed by the authors using Scopus Tools.

Evolution of Published Studies: Over time, a clear trend emerges, signifying a noteworthy escalation in the corpus of publications germane to sustainable entrepreneurial behavior. An exhaustive examination of documents in the Scopus database has substantiated this chronological pattern, revealing a steady increase in the volume of publications starting in 1991, as visually depicted in Figure 3. This empirical evidence underscores the growing academic interest and attention given to the topic within the specified period.

Figure 3: Document by Year



Sources: Developed by the authors using Scopus Tools.

Table 3 provides a detailed summary of publication volume, percentages, and cumulative percentages of documents published on sustainable entrepreneurial behavior. Notably, the year 2022 stands out as the peak, recording the largest proportion of publications at 18.0%.

Table 3: Year of Publications

Year	Total Publications	Percentage (%)	Cumulative Percent (%)
2022	120	18.0	18.0
2021	101	15.2	33.2
2020	86	12.9	46.1
2019	79	11.9	58.0
2018	37	5.6	63.5
2017	51	7.7	71.2
2016	25	3.8	74.9
2015	22	3.3	78.2
2014	33	5.0	83.2
2013	25	3.8	86.9
2012	14	2.1	89.0
2011	8	1.2	90.2

2010	13	2.0	92.2
2009	4	0.6	92.8
2008	14	2.1	94.9
2007	5	0.8	95.6
2006	5	0.8	96.4
2005	3	0.5	96.8
2004	1	0.2	97.0
2003	5	0.8	97.7
2002	4	0.6	98.3
2001	3	0.5	98.8
2000	2	0.3	99.1
1999	2	0.3	99.4
1998	1	0.2	99.5
1997	1	0.2	99.7
1996	1	0.2	99.8
1991	1	0.2	100.0

Sources: Developed by the authors using Scopus Tools.

Languages of Documents: English is the predominant language for scholarly communication, with 648 publications, constituting 97.0% of the total. Concurrently, a minority of publications are distributed across other languages, including Spanish, Portuguese, German, French, Croatian, Japanese, Russian, and Ukrainian.

Table 4: Languages Used for Publications

Language	Total Publications	Percentage (%)
English	648	97.0%
Spanish	7	1.1%
Portuguese	4	0.6%
German	3	0.5%
French	2	0.3%
Croatian	1	0.2%
Japanese	1	0.2%
Russian	1	0.2%
Ukrainian	1	0.2%
Total	**668**	**100.0**

Sources: Developed by the authors using Scopus Tools.

Subject Areas: Table 5 reveals that scholars have mostly examined sustainable entrepreneurial behavior within subject areas of significant attention, with each field surpassing the 20% threshold. Subject areas that received significant attention in scientific research include business, management, and accounting (47.3%); social science (37.8%); environmental science (29.3%); economics, econometrics, and finance (21.3%); and energy (21.02%). This distribution underscores the interdisciplinary nature of research on sustainable entrepreneurial behavior, demonstrating its confluence with diverse academic domains.

Table 5: Subject Area

Subject Area	Total Publications	Percentage (%)
Business, Management and Accounting	315	47.3
Social Sciences	252	37.8
Environmental Science	195	29.3
Economics, Econometrics and Finance	142	21.3
Energy	140	21.0
Engineering	112	16.8
Computer Science	75	11.3
Decision Sciences	43	6.5
Agricultural and Biological Sciences	30	4.5

Medicine	30	4.5
Earth and Planetary Sciences	20	3.0
Psychology	20	3.0
Mathematics	16	2.4
Arts and Humanities	14	2.1
Biochemistry, Genetics and Molecular Biology	5	0.8
Materials Science	5	0.8
Chemical Engineering	4	0.6
Immunology and Microbiology	4	0.6
Physics and Astronomy	3	0.5
Health Professions	2	0.3
Nursing	2	0.3
Chemistry	1	0.2
Multidisciplinary	1	0.2
Neuroscience	1	0.2
Pharmacology, Toxicology and Pharmaceutics	1	0.2
Veterinary	1	0.2

Most Active Source Titles: Table 6 displays the source titles that have published the highest number of articles on sustainable entrepreneurial behavior, based on a minimum threshold of five publications per source title. The table indicates that Sustainability Switzerland has the highest number of publications, with 91 (13.7%). Subsequently, the Journal of Cleaner Production published 13 articles, and Frontiers in Psychology published 10 articles.

Table 6: Most Active Source Title

Source Title	Total Publications	Percentage (%)
Sustainability Switzerland	91	13.7%
Journal Of Cleaner Production	13	2.0%
Frontiers In Psychology	10	1.5%
International Journal of Entrepreneurial Behavior and Research	8	1.2%
E3s Web of Conferences	7	1.1%
Business Strategy and The Environment	6	1.0%
Developments In Marketing Science Proceedings of The Academy of Marketing Science	6	1.0%
Journal Of Business Venturing	6	1.0%
Proceedings Of the European Conference on Innovation and Entrepreneurship Ecie	6	1.0%
World Review of Entrepreneurship Management and Sustainable Development	6	1.0%
Emerald Emerging Markets Case Studies	5	0.8%
International Journal of Environmental Research and Public Health	5	0.8%
Journal Of Sustainable Tourism	5	0.8%
Management Of Environmental Quality an International Journal	5	0.8%

Sources: Developed by the authors using Scopus Tools.

Top Keywords: Table 7 presents the primary keywords, which are concepts that consistently appear and have significant prominence across a collection of academic publications. The prominence of a keyword often indicates the relevance and importance of the topic under investigation. The term “sustainable development” appears in 192 publications, representing almost 20% of the total. The terms “sustainability,” “entrepreneurship,” “entrepreneur,” “innovation,” “sustainable entrepreneurship” and “social entrepreneurship,” have a combined occurrence rate of over 5%.

Table 7: Top Keywords

Author Keywords	Total Publications	Percentage (%)
Sustainable Development	192	28.8%
Sustainability	121	18.2%
Entrepreneurship	102	15.3%
Entrepreneur	96	14.4%
Innovation	67	10.1%
Sustainable Entrepreneurship	49	7.4%
Social Entrepreneurship	39	5.9%
Human	27	4.1%
Education	23	3.5%
Article	22	3.3%
Consumption Behavior	22	3.3%
Perception	22	3.3%
Students	22	3.3%
Economics	21	3.2%
Business Development	19	2.9%
Corporate Social Responsibility	19	2.9%
Humans	19	2.9%
Business	18	2.7%
Consumer Behavior	18	2.7%
Small And Medium-sized Enterprise	18	2.7%

Sources: Developed by the authors using Scopus Tools.

Figure 4: Word Cloud of the keywords



Sources: Developed by the authors using a word cloud generator.

A comprehensive analysis was performed on a collection of 666 publications from 1991 to 2022. These articles were selected based on the presence of author-assigned keywords in the Scopus database. The outcome of this thorough examination is presented in Figure 4, which displays a word cloud that visually represents the frequency and importance of specific terms in the analyzed dataset.

Geographical Distribution of Publications: China has established a notable presence, with a cumulative total of 75 publications. Following China, the United States, the United Kingdom, Germany, and India are substantial contributors, with each country contributing more than 5% of the total publications. Table 8 represents the global distribution of academic publications.

Table 8: Top 20 Countries Contributed to the Publications

Country	Total Publications	Percentage (%)
China	75	11.3%
United States	66	10.0%
United Kingdom	48	7.2%
Germany	46	6.9%
India	35	5.3%
Spain	32	4.8%
Italy	31	4.7%
Netherlands	31	4.7%
Romania	31	4.7%
Australia	27	4.1%
France	24	3.6%
Pakistan	22	3.3%
Canada	20	3.0%
Malaysia	20	3.0%
South Africa	18	2.7%
Poland	17	2.6%
Portugal	17	2.6%
Finland	14	2.1%
Indonesia	14	2.1%
Russian Federation	14	2.1%

Authorship: The identification of the most productive authors entails a quantitative assessment of the number of publications they have authored or co-authored within a specific dataset or timeframe. Analysis and compilation of the most prolific authors provide useful insights into the individuals who have significantly contributed to shaping and advancing the discourse within a particular research project on sustainable entrepreneurial behavior as shown in Table 9. Dimitrov, Dimitrova, and Nazir yielded a return exceeding 0.5%. Understanding the most prolific authors is advantageous for multiple reasons. It promotes the identification of prominent thinkers and experts in the field, enables the acknowledgment of influential contributors, and establishes a foundation for collaborative networking within the academic community. Moreover, it assists researchers, institutions, and funding agencies in making well-informed decisions regarding potential collaborators, mentors, or individuals to engage in research endeavors.

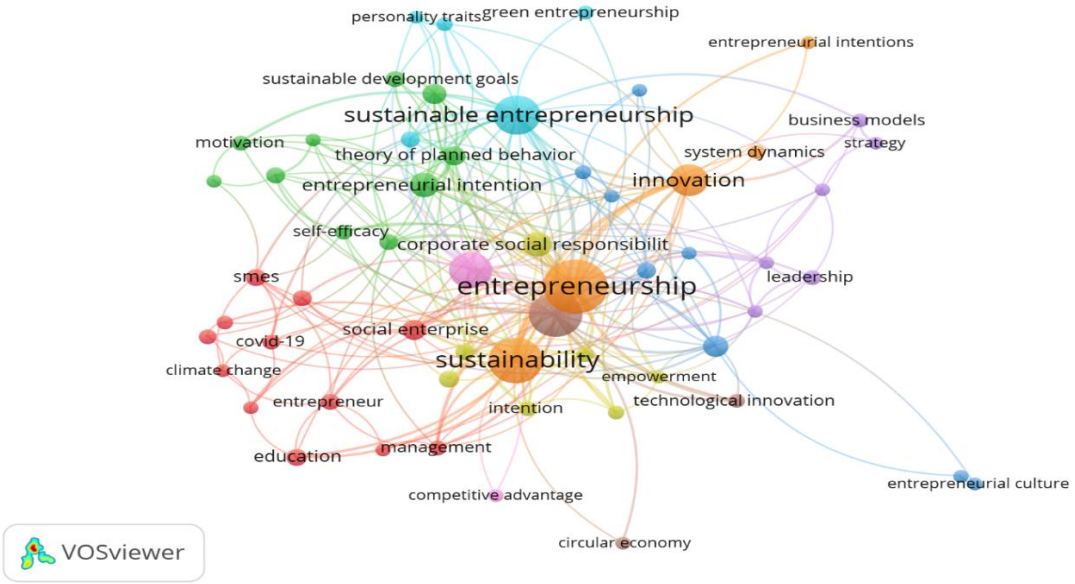
Table 9: Most Productive Authors

Author's Name	No. of Documents	Percentage (%)
Dimitrov, I.	4	0.6%
Dimitrova, A.	4	0.6%
Nazir, M.	4	0.6%
Dean, T.J.	3	0.5%
Dickel, P.	3	0.5%
Feder, E.S.	3	0.5%
Kratzer, J.	3	0.5%
Yasir, N.	3	0.5%
Agterbosch, S.	2	0.3%
Agu, A.G.	2	0.3%
Ahmad, K.	2	0.3%
Allen, L.K.	2	0.3%
Arshad, A.	2	0.3%
Ashraf, S.F.	2	0.3%
Atiku, S.O.	2	0.3%

Badulescu, D.	2	0.3%
Behl, A.	2	0.3%
Ben Amara, D.	2	0.3%
Brettel, M.	2	0.3%
Cantaragiu, R.	2	0.3%

Text Analysis: Aiming to comprehensively visualize and map sustainable entrepreneurial behavior, a corpus comprising 666 academic articles was collected and cataloged within the Scopus database. To perform a detailed analysis of this extensive dataset, researchers employed VOS viewer, a sophisticated analytical tool. The primary objective of this analytical exercise was to explore the co-occurrence network that exists within the authors' keywords assigned to these articles, as shown in Figure 5.

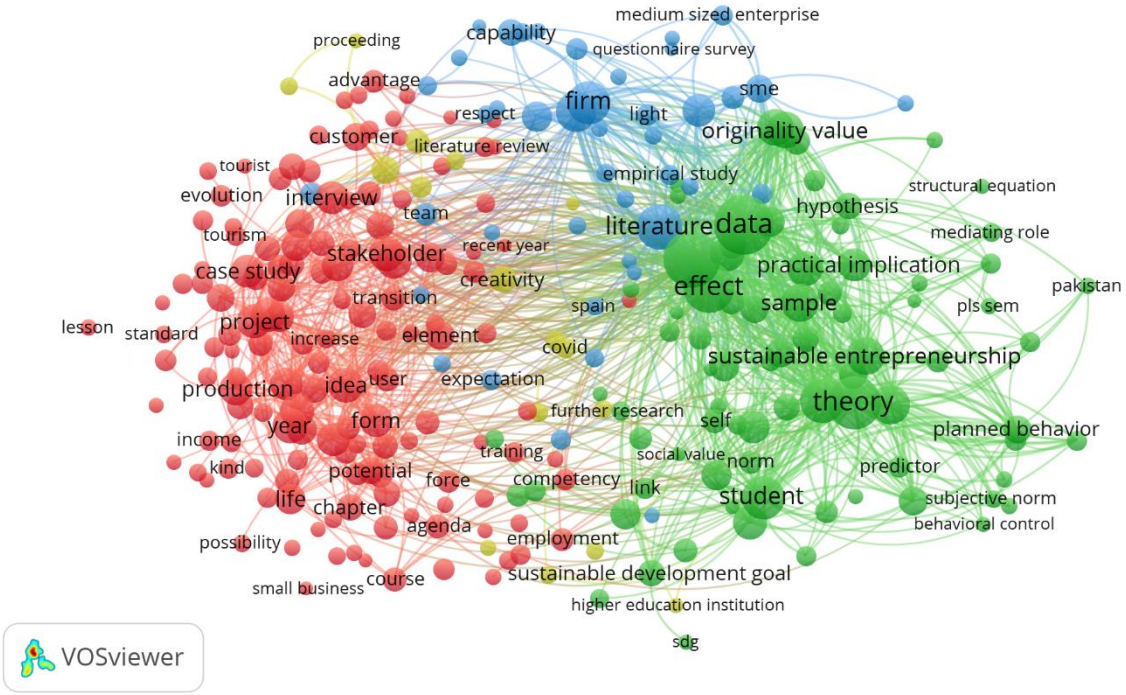
Figure 5: VOS Viewer Visualization of a Term Co-Occurrence Network Based on Author Keywords (Binary Counting)



Sources: Developed by the authors using VOS viewer.

The co-occurrence network is a visual representation that reveals relationships between title and abstract in the academic discourse on sustainable entrepreneurial behavior. It serves as a robust tool for identifying common themes and connections. Through the examination of patterns of title co-occurrence, researchers gain insights into the thematic clusters, focal points, and interdisciplinary intersections that characterize the scholarly landscape. By systematically analyzing patterns of title co-occurrence, scholars can establish the interconnections between diverse research inquiries within the realm of sustainable entrepreneurial behavior. Adopting this perspective facilitates the identification of significant concepts that captivate scholars and the delineation of novel ideas that establish connections across diverse academic disciplines.

Figure 8: VOS Viewer Visualization of a Term Co-Occurrence Network Based on Title and Abstract Fields (Binary Counting)



Sources: Developed by the authors using VOS viewer**.**

The co-occurrence network analysis of titles and abstracts, depicted in Figure 8, is a robust mechanism for uncovering the underlying structure and thematic diversity inherent in the scholarly discourse on sustainable entrepreneurial behavior. This analysis significantly enhances the depth and breadth of knowledge in this field.

Citation Analysis: Citation analysis is a methodological approach used in bibliometric analysis to examine and quantify citations in academic literature. The primary objective of this analysis is to understand the patterns of citation between academic publications, as indicated in Table 10. Over 32 years, a total of 666 papers have been identified. The citation intensity is quantified at an average rate of 367.88 citations per year, offering a dynamic perspective of the consistent scholarly influence over time.

Table 10: Citations Metrics

Metrics	Data
Publication years	1991-2022
Citation years	32 (1991-2023)
Papers	666
Citations	11772
Citations/year	367.88
Citations/paper	17.68
Citations/author	6005.31
Papers/author	302.45
h-index	45
g-index	95

Table 11: Highly Cited Articles

No.	Authors	Title	Year	Cites	Cites per Year
1	T.J. Dean, J.S. McMullen	Toward a theory of sustainable entrepreneurship: Reducing environmental degradation through entrepreneurial action	2007	806	50.4
2	J. Klewitz, E.G. Hansen	Sustainability-oriented innovation of SMEs: A systematic review	2014	683	75.9
3	N.M. Carter, W.B. Gartner, P.D. Reynolds	Exploring start-up event sequences	1996	578	21.4
4	D. Rodrik	Policy uncertainty and private investment in developing countries	1991	393	12.3
5	J.K. Hwee Nga, G. Shamuganathan	The Influence of personality traits and demographic factors on social entrepreneurship start up intentions	2010	376	28.9
6	R.M. Kanter	From spare change to real change. The social sector is a beta site for business innovation.	1999	355	14.8
7	R. Bohnsack, J. Pinkse, A. Kolk	Business models for sustainable technologies: Exploring business model evolution in the case of electric vehicles	2014	349	38.8
8	D.F. Pacheco, T.J. Dean, D.S. Payne	Escaping the green prison: Entrepreneurship and the creation of opportunities for sustainable development	2010	310	23.9
9	S. Wu, L. Wu	The impact of higher education on the entrepreneurial intentions of university students in China	2008	241	16.1
10	H. Simon	Hidden champions of the twenty-first century: Success strategies of unknown world market leaders	2009	217	15.5
11	A.L. Larson	Sustainable innovation through an entrepreneurship lens	2000	197	8.6
12	V. Griskevicius, S.M. CantÃº, M. Van Vugt	The evolutionary bases for sustainable behavior: Implications for marketing, policy, and social entrepreneurship	2012	185	16.8
13	E. Pomarici, R. Vecchio	Millennial generation attitudes to sustainable wine: An exploratory study on Italian consumers	2014	183	20.3
14	S.M. Danes, J. Lee, K. Stafford, R.K.Z. Heck	The effects of ethnicity, families and culture on entrepreneurial experience: An extension of sustainable family business theory	2008	177	11.8
15	M. Schindehutte, M.H. Morris, A. Kocak	Understanding market-driving behavior: The role of entrepreneurship	2008	162	10.8
16	R. Strausz	A theory of crowdfunding: A mechanism design approach with demand uncertainty and moral hazard	2017	147	24.5
17	A.M. Vuorio, K. Puumalainen, K. Fellnhofer	Drivers of entrepreneurial intentions in sustainable entrepreneurship	2018	136	27.2
18	R. Isaak	The making of the ecopreneur	2002	136	6.5
19	M. Fretschner, S. Weber	Measuring and understanding the effects of entrepreneurial awareness education	2013	133	13.3
20	L.H. Chung, P.T. Gibbons	Corporate Entrepreneurship: The roles of ideology and social capital	1997	130	5.0

Highly cited articles in bibliometric analysis are scholarly works that have garnered a significant number of citations from other academic publications. Identifying highly cited articles is crucial for assessing the impact, influence, and visibility of research in a particular field. Table 11 displays the maximum number of citations per year, which is 50.38, for the article titled "Towards a Theory of Sustainable Entrepreneurship: Reducing Environmental Degradation Through Entrepreneurial Action" by Dean and McMullen in 2007.

5. Conclusion

The Sustainable Development Goals (SDGs) have emerged as the dominant framework for global economic development in the 21st century. They represent a transition towards a more inclusive, environmentally aware, and socially responsible approach. Entrepreneurship is vital to addressing pressing issues like climate change, resource depletion, and social inequity. Sustainable entrepreneurial behavior is becoming a pivotal component of this transformative agenda. The study explores the increasing awareness of social and environmental sustainability, emphasizing the link between entrepreneurial activity and the need for sustainability. Given the complications faced by conventional profit-centric models in balancing economic objectives with environmental and social responsibilities, it is crucial to cultivate sustainable entrepreneurial behavior. This insight demonstrates the interdependence between economic progress and the wider objectives of environmental conservation and societal equity. Theoretical implications emphasize the evolving landscape of sustainable entrepreneurial behavior research, highlighting the need for an ongoing investigation in this dynamic field. The study underscores strategic imperatives for enterprises to prioritize sustainability as an objective. Entrepreneurs are urged to cooperate in creating solutions aligned with the multifaceted principles of sustainable development.

The practical implications highlight the importance of raising awareness about the critical nexus between sustainable development and entrepreneurship. The study suggests that understanding this connection can serve as a catalyst for increased participation in sustainable business initiatives, fostering a comprehensive commitment to sustainable business practices. Despite having gained valuable insights, the study acknowledges certain limitations. The focus on English-language literature and reliance on a specific database might restrict the generalisability of findings. Moreover, bibliometric analysis on the specific topic of sustainable entrepreneurship remains relatively uncharted, indicating the necessity for further extensive investigation. Thus, future research should delve into non-English literature and consistently observe emerging trends and sustainable cultures to advance knowledge of sustainable entrepreneurial behavior. The study posits sustainable entrepreneurship as a catalyst for transformation, necessitating continuous dedication to environmentally and socially responsible business strategies toward achieving sustainable and responsible global economic development. Social entrepreneurship has emerged as a potent catalyst for attaining beneficial transformation, specifically targeting the resolution of social and environmental concerns. The term "social entrepreneurship" has recently gained significant prominence in academic literature, ranking among the top keywords in numerous studies.

Although social entrepreneurship shows great potential, it is not devoid of obstacles. Social entrepreneurs can encounter difficulties in securing funding, assessing social impacts, and navigating regulatory frameworks. Addressing these issues requires a collaborative effort from governments, non-profit organizations, and the private sector to establish a conducive environment for social ventures. Governments and policymakers can play a pivotal role in fostering an environment that supports social entrepreneurship for sustainable development. Implementing policies that provide financial incentives, streamlined regulations, and social impact measurement can encourage the growth of social enterprises. Furthermore, integrating social entrepreneurship into educational curricula can cultivate a new generation of socially conscious entrepreneurs. Furthermore, education not only imparts knowledge but also plays a crucial role in shaping the mindset of prospective entrepreneurs. Instilling a sustainability mindset involves cultivating values such as responsibility, empathy, and a long-term orientation. By emphasizing the triple bottom line—people, planet, and profit—educational programs can nurture entrepreneurs who are not only business-savvy but also socially and environmentally conscious. Thus, by shaping a new generation of entrepreneurs who are well-versed in sustainable business practices, educational institutions contribute to the broader objective of creating a more resilient, responsible, and sustainable global economy.

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