Information Management and Business Review (ISSN 2220-3796)
Vol. 15, No. 3(SI), pp. 359-368, September 2023

Bibliometric Analysis of Technopreneurship Research in Scopus Database

Nur Atiqah Zakiyyah Ramlee*, Lina Nadia Abd Rahim, Hardy Loh Rahim & Nursaadatun Nisak Ahmad
Faculty of Business and Management, Universiti Teknologi MARA, Malaysia
*nurat3842@uitm.edu.my, linanadia@uitm.edu.my, hardy@uitm.edu.my, nursa040@uitm.edu.my

Abstract: Post Covid-19 outbreak has shown a growing trend in technology adoption. Instantaneously, the research on technology entrepreneurship has surged to shed light on the impact of this research on the national economy. This research aims to explore research papers specifically research journal articles on technopreneurship that were published in the Scopus database. 489 and 106 documents were found in the Scopus database on the query of technology entrepreneurship and technopreneurship and were extracted to VOSviewer for data visualization. Key themes were identified using co-word or co-occurrence analysis, and relevant future study directions were demonstrated.

Keywords: *Technology entrepreneurship research, technopreneurship research, bibliometric, Scopus, VOSviewer, and co-word analysis.*

1. Introduction

Research on technology entrepreneurship or technopreneurship has been conducted by various researchers all over the world since the term was first used in 1968 to discuss the role of developing entrepreneurship that interacts with technology. The objective of this research is to explore research papers specifically research journal articles on technopreneurship that were published in Scopus. The data extracted from the Scopus database and search query was refined and intended to focus on technopreneurship and technology entrepreneurship. The VOSviewer software was opted for this study to envision the terms technology entrepreneurship and technopreneurship research. Previous studies on technology entrepreneurship have been conducted by scholars from various countries and the research has been published in various platforms such as conferences, conceptual papers, matrix analysis, empirical research, problem identification, etc. Bibliometric research is the analysis of the literature on a specific topic that extends beyond just compiling scientific texts and their contributions to theory and practice (Rodrigues, Daniel, and Franco, 2022). Mentzer and Kahn (1995) stated the critical value of summarizing.

The literature on the issue is under consideration and identifying gaps and developing routes for future study, with the main goal of contributing to the advancement of scientific knowledge on the subject. According to Elisabetta et al. (2019); and Geng et al. (2017), in the context of quantitative studies, bibliometric is a statistical analysis approach that is useful for assessing the research outputs, relevance, and impact exerted by authors, colleges or universities, journals, and so on within the area of study. According to Yordanova et al. (2020); and Beckman et al. (2012), technopreneurship is a combination of technology entrepreneurship that indicates entrepreneurship emerges entrepreneurship and also technology-based innovation. It contributes to the improvement and expansion of the firm by resulting in higher revenue from an improved product by employing technology (Gebrekidan, 2023). Various scholars used technopreneurship in their literature, while several others used the term technology entrepreneurship in their study. Hence, this study will analyze both key terms to get a clear visual of the trend in this research area.

2. Literature Review

Technopreneurship is a combination of technology and entrepreneurship. The key term has been used by many researchers since 1983, the year it was introduced. Byers (1983) defines technopreneurs as entrepreneurs who are technologically knowledgeable and employ technology in the entrepreneurship process. Technology entrepreneurship is defined as the establishment of a new firm with goods or services that are based substantially on the application of scientific or technological knowledge (Yordanova, 2021; Allen, 1992). Technopreneurship has been referred to by multiple names, including technology entrepreneurship, techno-entrepreneurship, technical entrepreneurship, and technology entrepreneurial ecosystems (Therin, 2007). In the age of technological digitization, an increasing number of technology

enterprises contribute to the economy and provide job opportunities, leading educational institutions to develop technopreneurs programs to instill entrepreneurial behavior in students (Hoque et al., 2017; Barbe, Magids, and Thornton, 2003). Technopreneurship is defined as the act of breaking the conventional economic order by developing new goods or services and utilizing new raw materials to capitalize on untapped prospects (Selladurai, 2016). According to the author, a technopreneur is someone who is technologically knowledgeable, has a creative mindset, is an optimist, and is courageous and enthusiastic about pursuing a road that has never been explored.

In the business world, the rise of technopreneurship is considered an economic development engine, as technology innovation typically improves the quality of life and provides more convenience, while also opening up new prospects for firms. According to Yordanova (2021), encouraging technopreneurship is critical since creating technologies may increase wealth value creation and economic growth. There has been limited research on technopreneurship in the academic sphere. Zhang et al. (2008), Koe et al. (2020), and Boller (2018) have agreed on this. Meanwhile, Yordanova (2021) and Mosey et al. (2017) propose more studies on the role of entrepreneurial education and university efforts in the development of talent and personal experience related to technology entrepreneurship. According to several recent studies, further research is needed to understand how colleges might support student entrepreneurship. According to Yordanova (2021), understanding ways for unleashing technical potential and boosting technological entrepreneurship among STEM students may both be obtained via study on technological processes.

3. Methodology

The data extracted from the Scopus database analyze search results that query the code TITLE-ABS-KEY (“technopreneurship”) and TITLE-ABS-KEY ("technology entrepreneurship"). The data was retrieved on 1st June 2023 and the result shows 106 documents for the keyword technopreneurship and 489 documents for the keyword technology entrepreneurship. It shows that most of the research tends to use technology entrepreneurship rather than technopreneurship, however, the number of documents is expected to increase from time to time. In addition, the VOSviewer software is also being used for data collection to analyze the co-authorship networks, co-occurrence, and keyword networks. For that purpose, query expansion (QE) was employed to refine the obtained literature based on the operational definition. The research objective is to explore research in the context of technopreneurship and technology entrepreneurship that was published in Scopus. For the QE process, the search string was used as follows: TITLE-ABS-KEY ("technology entrepreneurship") ensure the documents shown that may have the elements of significant usage such as printed books, e-learning, and database systems exhibit the co-occurrence of technology entrepreneurship documents.

4. Research and Discussion

Figure 1 shows that the first research article on technology entrepreneurship was published in 1969 with 489 search results. When the search string TITLE-ABS-KEY (technology AND entrepreneurship) is used, it shows that the first paper was published in 1968 with 9801 documents shown. On the other hand, for the technopreneurship keyword, the result shows that the keyword was first used in 2000, with 106 documents shown (refer to figure 2). This indicated that the word technopreneurship which is a combination of technology and entrepreneurship was first published in Scopus in the year 2000 by Arora VK. As shown in Figure 1, the search result for the keyword ‘technology entrepreneurship’ shows that 50 documents were published in 2019 which was the greatest number, followed by 45 documents the following year. The third and fourth highest number of documents was published in 2022 and 2014, with 39 and 38 documents respectively. Meanwhile, Figure 2 shows that the greatest number of documents published about technopreneurship was in 2020 with 17 documents, followed by 14 documents in both the years 2021 and 2022. Looking at this trend, the COVID-19 pandemic that started in 2019 has made research on technology entrepreneurship more popular as the world has shifted to digital transformation.

Figure 1: Screenshot of Scopus Document by Year for Technology Entrepreneurship Keyword

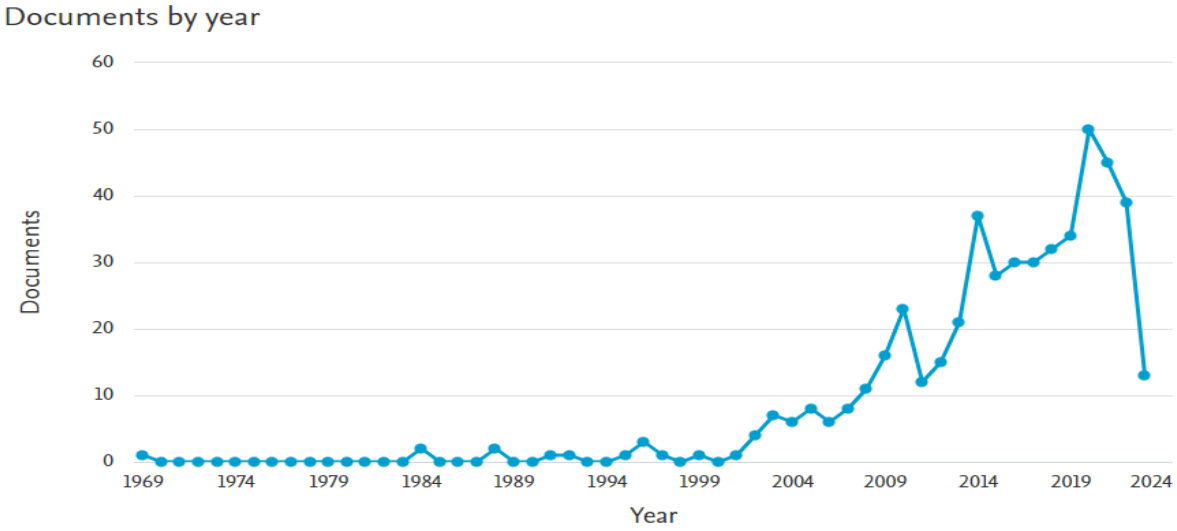


Figure 2: Screenshot of Scopus Document by Year for Technopreneurship Keyword

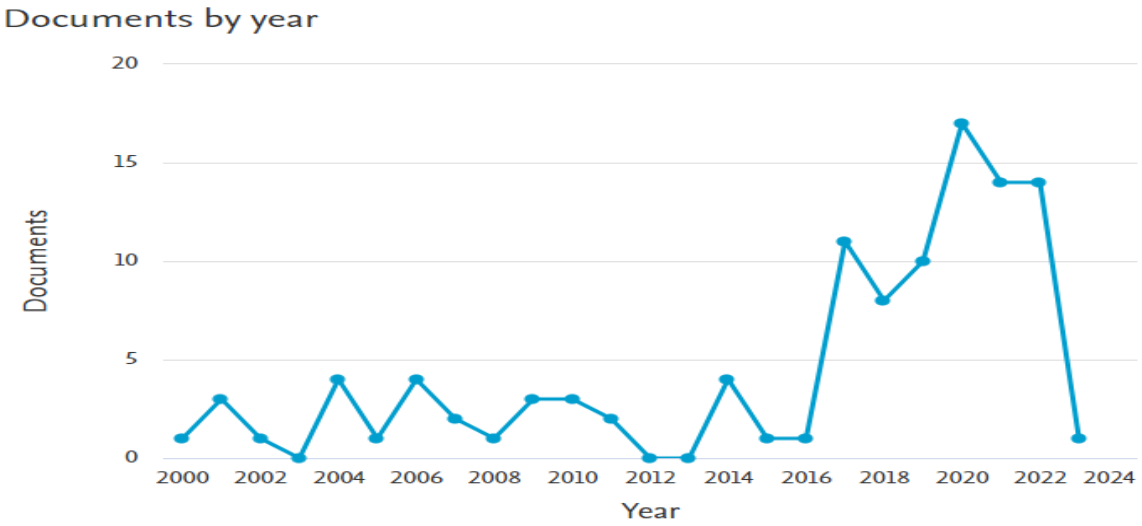


Figure 3 shows the graphs that exhibit the sources by year, from the year 2003 until 2023. Based on the graph, the highest number of documents per year came from Technological Forecasting and Social Change with 20 documents published between the years 2013 and 2022. Subsequently, the second highest number of documents per year came from the Journal of Technology Transfer with 10 documents published from 2013 until 2021, followed by the journal named Technovation with 9 documents between 2010 and 2023. Meanwhile, the least number of documents were published by the Journal of Business Research and the Proceedings Frontiers in Education Conference Fie with 7 documents each, between the years 2013 and 2022 and between 2003 and 2017 respectively. On the other hand, for the keyword technopreneurship (refer to Figure 4), only a small number of documents were published. The greatest number of documents was only 3 documents, which were published individually by five journals, namely, ACM International Conference Proceeding Series, Aip Conference Proceedings, International Journal of Economic Research, International Journal of Technology Management and Journal of Physics Conference Series. The other source had published not more than 3 journals.

Figure 3: Screenshot of Scopus Document by Year and Sources for Technology Entrepreneurship Keyword

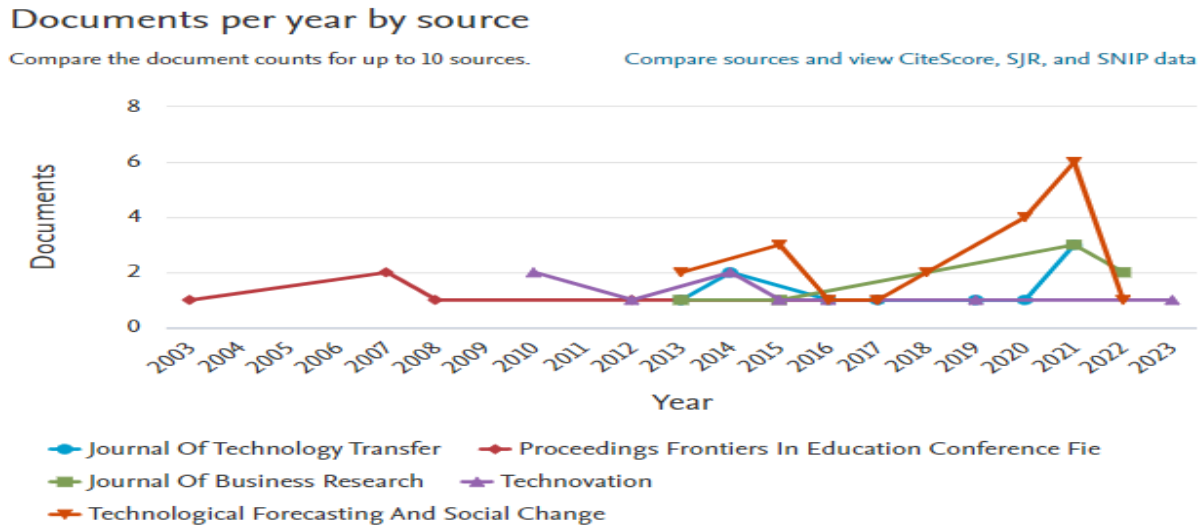
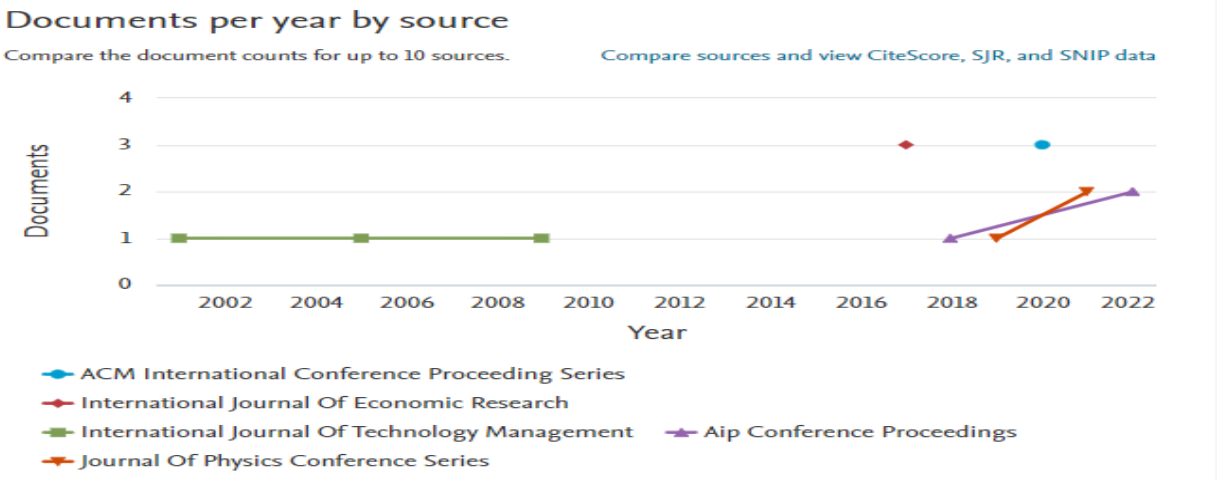


Figure 4: Screenshot of Scopus Document by Year and Sources for Technopreneurship Keyword



The graph in Figure 5 shows the documents published by different authors in the Scopus database. Most of the documents were published by Walsh, S.T. with 11 documents, followed by Walsh, S with 9 documents, Elia, G with 8 documents, Giones, F with 7 documents, while the rest of the authors had published not more than 6 documents. Meanwhile, for technopreneurship documents (refer to Figure 6); the highest number of documents is 8 documents which were published by Sutopo, W. The second highest is 5 documents, published by Hisjam, M. This is followed by 3 documents each, published by Herawati, S., Hidayat, H., Koe, W.L., Milton-Smith, J. and Wong, P.K.

Figure 5: Screenshot of Scopus Document by Authors for Technology Entrepreneurship Keyword

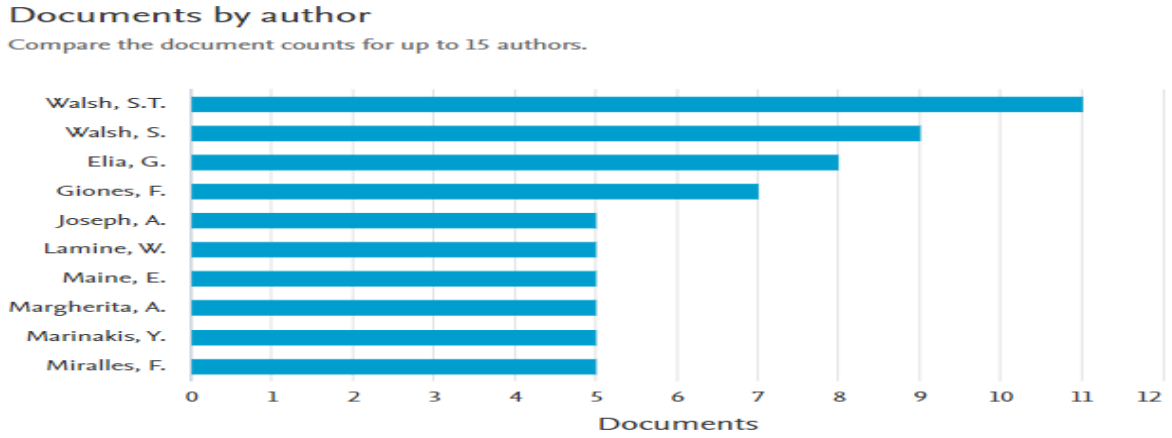
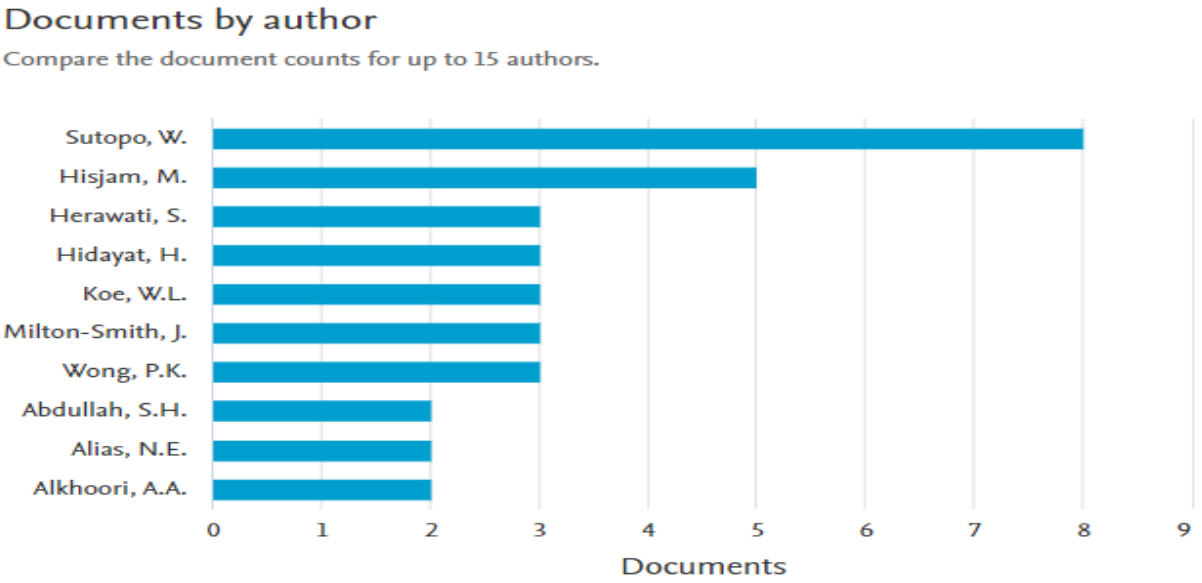


Figure 6: Screenshot of Scopus Document by Authors for Technopreneurship Keyword



The graph in Figure 7 shows documents published by affiliation in the Scopus database. The highest number of documents published on technology entrepreneurship is by The University of New Mexico with 20 documents, followed by 12 documents by Universiteit Twente, and 11 documents by Universita del Salento. Next in order are the University of Maryland, College Park and University of Ottawa with 8 documents each. It appears that the other affiliations had published less than 8 documents. Meanwhile, Figure 8 shows Scopus documents published by affiliations when the technopreneurship keyword is used. The greatest number of documents was published by Universitas Sebelas Maret with 8 documents. The second-highest number of documents was published by Universiti Teknologi MARA and the National University of Singapore with 5 documents from each university. This is followed by 4 documents published by Nanyang Technological University. For the rest of the affiliations, less than 4 documents were published. The above trend shows that the technopreneurship keyword is more familiar and popular among researchers from Asian countries, whereas most Western countries prefer to use the key term technology entrepreneurship in its full form. Details of the country of origin of the documents can be found in the next figures.

Figure 7: Screenshot of Scopus Document by Affiliations for Technology Entrepreneurship Keyword

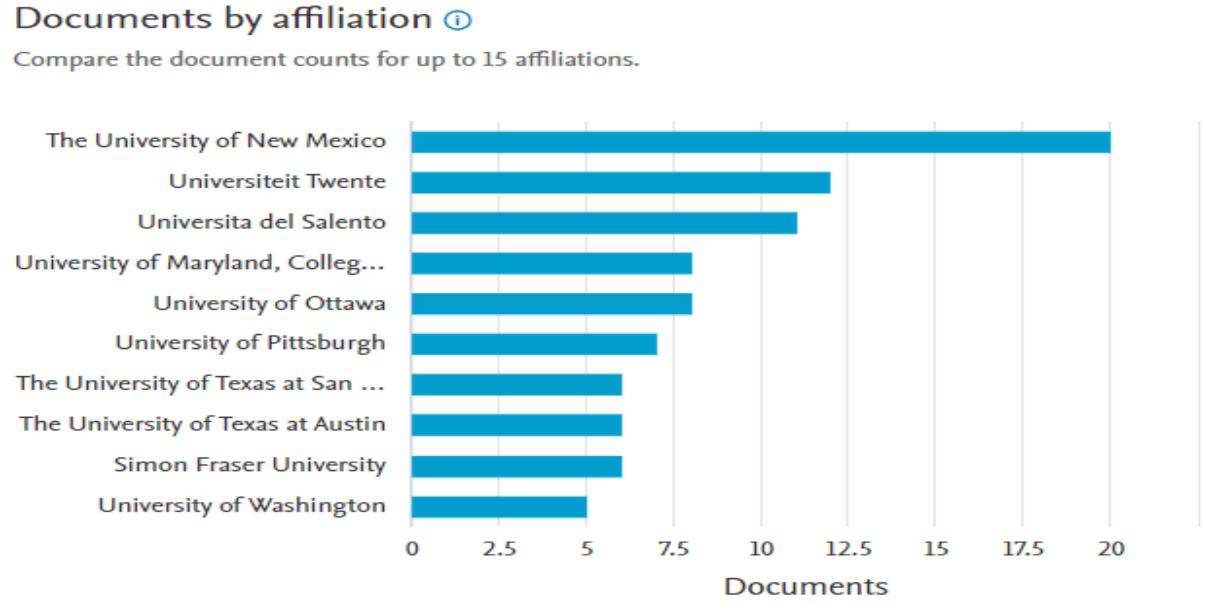
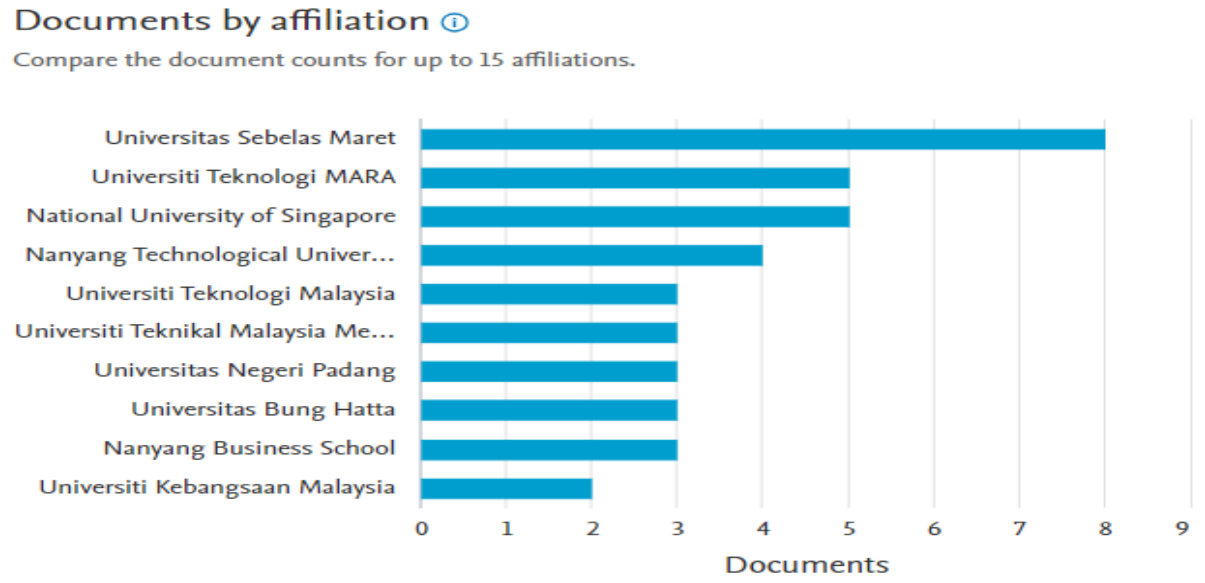


Figure 8: Screenshot of Scopus Document by Affiliations for Technopreneurship Keyword



Figures 9 and 10 show the graph of documents by country or territory that were published in the Scopus database for both the key terms technology entrepreneurship and technopreneurship. Using the keywords technology entrepreneurship, the country with the highest number of documents is the United States with 170 documents. The second highest is the United Kingdom with 49 documents published. This is followed by Canada, China, and the Russian Federation with 27, 25, and 23 published documents respectively. Meanwhile, for the technopreneurship keyword, the highest number of documents is from Indonesia with a total of 33 documents. The second highest is Malaysia with 22 documents, followed by Singapore with 8 documents and India with 7 documents making them the third and fourth highest. The rest of the countries published not more than 3 documents. The graph indicated that the technopreneurship key term is widely used among researchers in Asia countries.

Figure 9: Screenshot of Scopus Document by Country/Territory for Technology Entrepreneurship Keyword

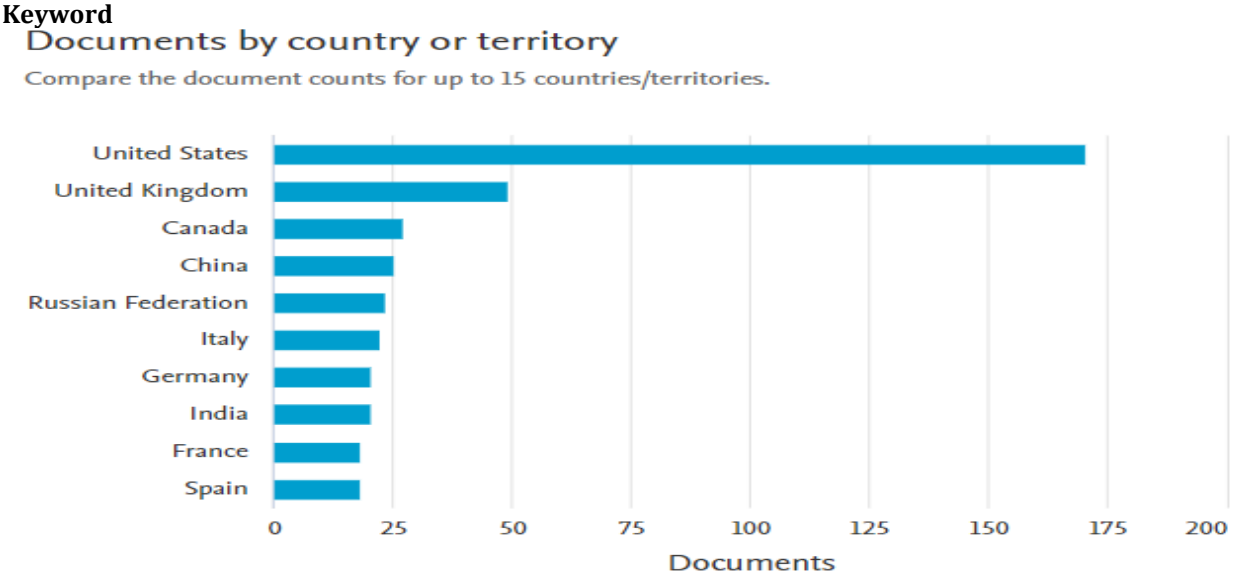


Figure 10: Screenshot of Scopus Document by Country / Territory for Technopreneurship Keyword

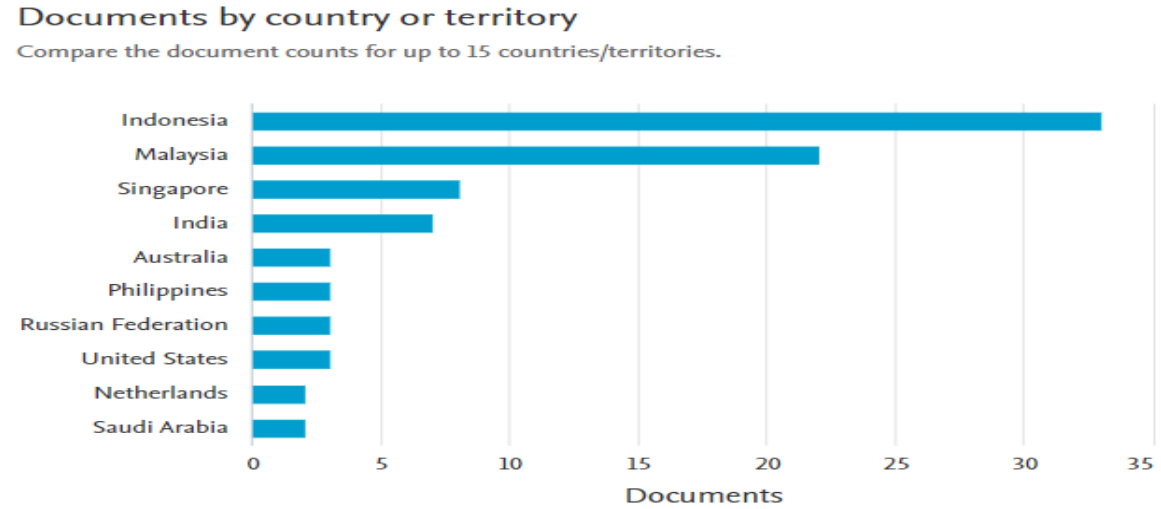


Figure 11: The 489 Documents via VOSviewer Co-Word Analysis

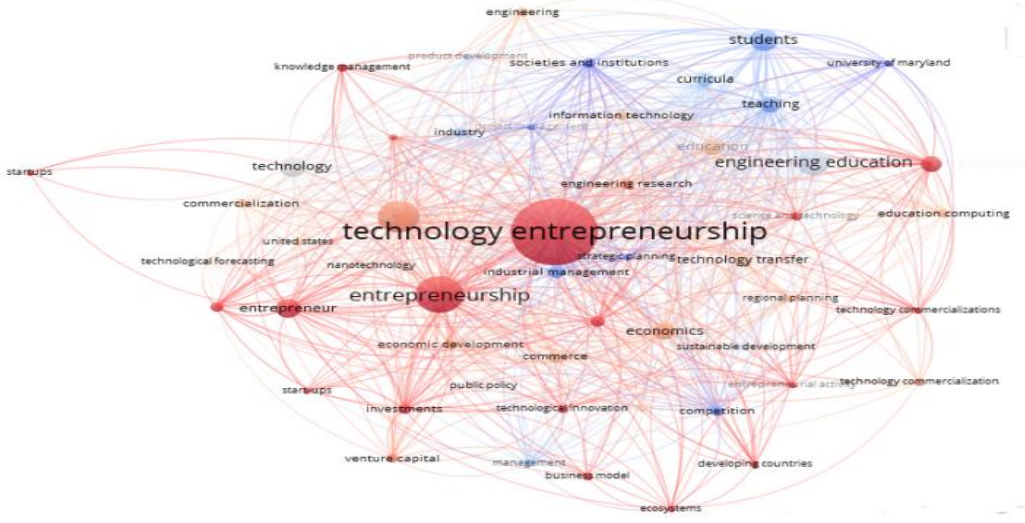


Figure 12: Keyword Classification based on Cluster in VOSviewer (Technology Entrepreneurship)

CLUSTER 1 (16 ITEMS)	CLUSTER 2 (13 ITEMS)	CLUSTER 3 (12 ITEMS)	CLUSTER 4 (6 ITEMS)	CLUSTER 5 (5 ITEMS)	CLUSTER 6 (1 ITEM)
Business model	Commercialization	Curricula	Education computing	Industry	engineering
Commerce	Entrepreneur	Education	Entrepreneurship education	Information technology	
Competition	Entrepreneurship	Engineering education	Science and technology	Knowledge-based system	
Developing countries	Innovation	Engineering Research	Technology commercialization	Knowledge management	
Economic and social effects	Investments	Marketing	Technology transfer	Nanotechnology	
Economic development	Public policy	Product development			
Economic growth	Start-ups	Project management			
Economics	Technological development	Societies and institution			
Ecosystems	Technological forecasting	Strategic planning			
Entrepreneurial activity	Technology	Students			
Industrial management	United States	Teaching			
Management	Venture capital	University of Maryland			
Regional planning					
Sustainable development					
Technological innovation					
Technology entrepreneurship					

From co-word data analysis collected from the software VOSviewer, the result was divided into clusters based on similar themes. Figure 11 illustrates the theme of the keywords which appear in different colors to indicate different clusters. The result was divided into 6 different clusters. The researcher interprets the cluster as follows: Cluster 1 Economy Impact, Cluster 2 Technology Advantage, Cluster 3 Education, Cluster 4 Technology Transfer, Cluster 5 Technology Advancement and Cluster 6 Engineering.

Figure 13: The 106 Documents on Technopreneurship via VOSviewer Co-Word Analysis

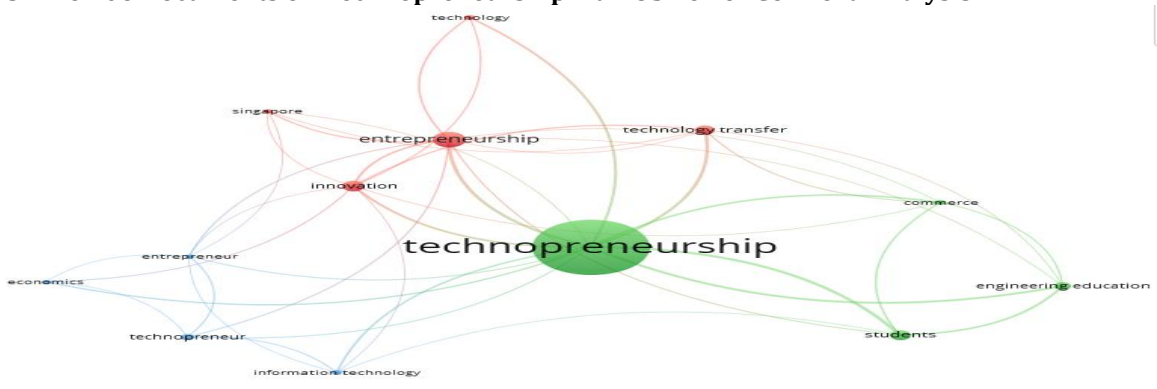


Figure 14: Keyword Classification based on Cluster in VOSviewer (Technopreneurship)

CLUSTER 1 (5 ITEMS)	CLUSTER 2 (4 ITEMS)	CLUSTER 3 (4 ITEMS)
Entrepreneurship	Commerce	Economics
innovation	Engineering education	Entrepreneur
Singapore	Students	Information technology
Technology	Technopreneurship	Technopreneur
Technology transfer		

Study Implication: The findings of this study may benefit future research in the field of technopreneurship or technology entrepreneurship. This study would provide information on keywords that have been used by previous researchers, sources of documents, authors and affiliations that contribute the most to technopreneurship studies, as well as the most documents found by territory or country. From the data, it is found that the term has been used differently in different territories. Technopreneurship is most likely used by researchers from Asia countries, while the keyword technology entrepreneurship has been widely used among researchers from Western countries. On the other hand, this study would be beneficial for academicians in providing analysis information on studies that have been conducted on technopreneurship. The information may further enrich the present evidence of study, and may also help the researchers to improve the current studies.

5. Conclusion

In conclusion, this research has analyzed previous research, particularly in the context of technology entrepreneurship and technopreneurship. Technology entrepreneurship and technopreneurship are defined the same, however, it appears that the term technopreneurship is more widely used by researchers from Asian countries, especially Southeast Asia. In addition, it has been revealed that this research topic has been conducted in a multidisciplinary approach and has a connection to entrepreneurship education and economic growth. Nevertheless, there are still hurdles that must be addressed to ensure that the oversight of technology entrepreneurship is on the right path to alleviate unemployment among graduates and improve the standard of living domestically and worldwide.

References

Allen, John. 1992. *Starting a Technology Business*. London: Pitman.

Boller, R. M. P. (2018, November). A Study on the Factors that Drive Technopreneurial Intention Among the Youth of Paranaque City. In *The 6th National Business and Management Conference* (2345, 292).

Barbe, D. F., Magids, S. A., & Thornton, K. S. (2003, November). Holistic approach for technology entrepreneurship education in engineering. In *33rd Annual Frontiers in Education, 2003. FIE 2003.* (Vol. 1, pp. T2D-1). IEEE.

Beckman, C., Eisenhardt, K., Kotha, S., Meyer, A., & Rajagopalan, N. (2012). Technology entrepreneurship. *Strategic Entrepreneurship Journal*, *6*(2), 89-93.

Byers, T. (1983). A study of technical entrepreneur'. Zutushi: Role of Technical Entrepreneurs in Industrial Development–A Literature View of Technological Entrepreneur. Global Business Press, Singapore.

Elisabetta, R., Gabriele, M., Massimo, S., Sofia, B. & Giuseppe, S. M. (2018). Structural trend and conceptual evolution of research on genetically modified organisms using a science mapping approach. *Journal of Cleaner Production*, 205, 329-338.

Gebrekidan, T. H., Chebo, A. K., Wubetie, Y. F. & Dhliwayo, S. (2023). Linking technology entrepreneurship to a business model towards the growth of ventures: Lessons from Ethiopian small manufacturing ventures. *Social Sciences & Humanities Open*, 8(1), 100506.

Geng, Y., Chen, W., Liu, Z., Chiu, A. S., Han, W., Liu, Z., & Cui, X. (2017). A bibliometric review: Energy consumption and greenhouse gas emissions in the residential sector. *Journal of cleaner production*, *159*, 301-316.

Hoque, A. S. M. M., Awang, Z. & Siddiqui, B. A. (2017). Technopreneurial intention among university students of business courses in Malaysia: A structural equation modeling. *International Journal of Entrepreneurship and Small & Medium Enterprise (IJESME)*, 4(7), 1-16.

Rodrigues, M., Daniel, A. D. & Franco, M. (2022). What is important to know about technopreunership? A

bibliometric analysis. International Journal of Organizational Analysis.

Mentzer, J. T. & Kahn, K. B. (1995). A framework of logistics research. *Journal of Business Logistics*, 16(1), 231.

Mosey, S., Guerrero, M., & Greenman, A. (2017). Technology entrepreneurship research opportunities: insights from across Europe. *The Journal of Technology Transfer*, *42*, 1-9.

UiTM Library e-Resources, U. (n.d.). UiTM EzAccess. UiTM Library e-Resources. https://www-scopus-com.ezaccess.library.uitm.edu.my/search/form.uri?display=basic#basic

Selladurai, M. (2016). Conceptual framework on technopreneurship. *SELP Journal of Social Science,* 7(27), 92-97.

Thérin, F. (Ed.). (2007). *Handbook of Research on Techno-entrepreneurship*. Edward Elgar Publishing.

Yordanova, D., Filipe, J. A. & Pacheco Coelho, M. (2020). Technopreneurial intentions among Bulgarian STEM students: The role of the university. *Sustainability*, 12(16), 6455.

Yordanova, D. (2021). Nascent Technology Entrepreneurship among Bulgarian STEM Students. *Administrative Sciences*, 11(4), 121.

Zhang, J., Souitaris, V., Soh, P. H., & Wong, P. K. (2008). A contingent model of network utilization in early financing of technology ventures. *Entrepreneurship Theory and Practice*, *32*(4), 593-613.