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Mapping Futures Literacy: Bibliometric Analysis and Future Research Directions

Gelecek Okuryazarlığının Haritasını Çıkarmak: Bibliyometrik Analiz ve Gelecekteki Araştırma Yönergeleri

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Abstract

Futures literacy is becoming a critical skill that includes individuals' abilities to understand, synthesize, and evaluate information in a rapidly changing world. This article aims to examine research trends and future research directions in the field of futures literacy. This article contains a comprehensive bibliometric analysis of futures literacy using the R program and VOSviewer tools with the Biblioshiny application of the bibliometrix package. This study identified 200 relevant studies published in the Scopus database until December 2023. As a result of the filtering, 87 relevant studies conducted between 2009 and 2023 were analyzed. As a result of the analysis, the United Kingdom is the most cited country and leads the way in international cooperation efforts. "Poli R." was determined as the most published author. Journals such as "Futures", "European Journal of Futures Research" and "Journal of Futures Studies" stand out among the most published ones. The most frequently used keywords include "future prospect", "literacy" and "learning". The study results provide researchers and practitioners in the field of futures literacy with important insight into the current status, outstanding studies, and potential future developments. It also provides a comprehensive view of the importance of futures literacy, shedding light on future research directions.

Keywords: *Futures literacy, Foresight, Futures studies, Sustainability, Bibliometric Analysis.*

Özet

Gelecek okuryazarlığı, hızla değişen bir dünyada bireylerin bilgiyi anlama, sentezleme ve değerlendirme yeteneklerini içeren kritik bir beceri haline gelmektedir. Bu makale, gelecek okuryazarlığı alanındaki araştırma eğilimlerini ve gelecekteki araştırma yönlerini incelemeyi amaçlamaktadır. Bu makale, bibliometrix paketinin Biblioshiny uygulamasıyla R programı ve VOSviewer araçları kullanılarak gelecek okuryazarlığının kapsamlı bir bibliyometrik analizini içermektedir. Bu çalışma, Aralık 2023'e kadar Scopus veri tabanında yayınlanmış 200 ilgili çalışmayı belirlemiştir. Filtreleme sonucunda 2009-2023 yılları arasında yapılmış 87 ilgili çalışma analiz edilmiştir. Yapılan analiz sonucunda Birleşik Krallık, en çok atıf alan ülke olarak uluslararası iş birliği çabalarında öncülük etmektedir. En çok yayınlanan yazar olarak "Poli R." belirlenmiştir. En çok yayınlananlar arasında "Futures", "European Journal of Futures Research" ve "Journal of Futures Studies" gibi dergiler öne çıkmaktadır. En sık kullanılan anahtar kelimeler arasında "future prospect", "literacy" ve "learning" yer

almaktadır. Çalışma sonuçları, gelecek okuryazarlığı alanındaki araştırmacılara ve uygulayıcılara mevcut durum, en önemli çalışmalar ve potansiyel gelecekteki gelişmeler hakkında önemli içgörüler sağlamaktadır. Ayrıca, gelecek okuryazarlığının önemine dair kapsamlı bir görüş sunarak gelecekteki araştırma yönlerine ışık tutmaktadır.

Anahtar Kelimeler: *Gelecek okuryazarlığı, Öngörü, Gelecek çalışmaları, Sürdürülebilirlik, Bibliyometrik Analiz*

1. INTRODUCTION

Determining effective strategies is "about preparing future" rather than being ready for the future (Karakaya and Çokpartal, 2023). Nowadays, rapid changes are taking place, and these rapid changes are now disturbing people. Past knowledge and experiences are no longer sufficient to provide guidance. It requires expanding the knowledge base people need to make decisions and developing new skills that allow them to navigate increasingly uncertain contexts. Therefore, it has become important to look to the future rather than the past. However, the most important problem is how to use the future. The question is whether people will develop these skills to colonize the future or improve people's capacity to desire a better life (Poli, 2021).

Numerous disasters such as climate change, racial inequality, global pandemics, and political polarization are clouding future dreams. Futures literacies help provide a proposed pedagogical intervention that considers the possibility of future(s) as an interdisciplinary research context (Horst and Gladwin, 2022). This means futures literacy is important in terms of being able to think about possible scenarios, follow trends, analyze data, and see and imagine future-shaping features (Mangnus et al., 2021). One cannot talk about "futures literacy" without taking into account ecological concerns and sustainability studies. If global warming is to be stopped, a socio-cultural transformation based on a respectful and compassionate approach is needed (Häggström and Schmidt, 2021).

Futures literacy aims to introduce techniques that will help people better foresee what they want the future to contain and how they will achieve that future. Thus, using the future differently means moving the world forward and "changing the conditions of change by learning". The key to achieving these goals is understanding what is foreseen and prepared, often without thinking about it. Therefore, the purpose of the "futures literacy" program is very important. (Miller, 2018; Jennische & Sörbom, 2023).

The literature on futures literacy has been increasing rapidly over the years, but it has been determined that there is a lack of studies showing where these studies are heading. For this reason, this study aimed to carry out a bibliometric analysis of publications related to futures literacy. To achieve this goal, a quantitative approach was used to conduct a bibliometric analysis of published articles. Bibliometric analysis is a numerical analysis that allows examining all studies done so far in a specific field. Bibliometric analysis is applicable in all field where academic studies are carried out and gives universal results (Demir et al., 2024a). Bibliometric analysis plays an important role in providing a comprehensive understanding of the existing literature (Demir et al., 2024 b).

In this study, Bibliometrix, an R package with a web-based interface, Biblioshiny and VOSviewer were used for bibliometric analysis. To our knowledge, this is the first bibliometric study to evaluate trends in futures literacy. This article provides guidance for a bibliometric analysis of research on futures literacy through the following research questions.

Q1: How does the growth trend of articles on futures literacy change over time and the citation status of these articles?

Q2: Who are the most cited and pioneering authors in the field of futures literacy? Which studies are most cited?

Q3: What are the most cited journals, documents, countries, and organizations in the field of futures literacy?

Q4: What are the main research areas and thematic studies on futures literacy? What topics stand out?

Q5: What are the keywords and terms still actively used in futures literacy literature? Which concepts stand out?

These research questions aim to evaluate research trends and the general state of the literature in the field of futures literacy.

This article is organized as follows. In Chapter 2, he provides a brief review of futures literacy. Chapter 3 provides an introduction of the research methodology. Chapter 4 will provide a discussion and analysis of the research results, identify and summarize research topics, research gaps, and futures literacy trends. In the last section, conclusions and limitations are presented.

2. FUTURES LITERACY CONCEPT and ITS IMPORTANCE

UNESCO began focusing on developing the discipline of foresight and futures literacy in 2012. This discipline contributes to foresight activities enabling people to understand the role that the futures literacy plays in the future. Finding previous methods for foresight studies inadequate, UNESCO supported the futures literacy program to produce technologies and methods that aim to have an active impact on the future, such as future scenarios and forecasts. Riel Miller made significant contributions to this program (Jennische, & Sörbom, 2023). Miller (2007, 2015, 2018), as head of the UNESCO Global Futures Literacy Network, Miller and his team have made significant contributions to the development of the field by developing a comprehensive Futures Literacy model. Miller's futures literacy framework has been largely operationalized in organizational, government and corporate discourses through UNESCO. (Horst and Gladwin, 2022). The first *Global Futures Literacy Design Forum* hosted by UNESCO was held in Paris in December 2019. At the forum, comprehensive measures for integrating futures literacy into management processes were presented from various perspectives, such as inclusiveness, higher education, and policymaking (Larsen et al.,2020; Häggström and Schmidt, 2021). Anticipatory assumptions produce 'futures that do not yet exist', which include 'imaginary' and 'different' types of futures' (Jennische, & Sörbom, 2023).

Miller (2007), who made important contributions to futures literacy, defined the concept of futures literacy as "the capacity to think about the potential of the present to give birth to the future by developing and interpreting stories about possible, likely, and desired futures." In other words, futures literacy is the ability to actively use the future in the present (Miller 2007; Poli,2021). When we stick to guesses, what is deemed less likely is overlooked and our ability to manage risk and strategic decision-making is undermined. The development of practical alternatives is developing very little. Since old paradigms do not disappear easily, solution approaches remain similar. Differences emerge in theory and practice. Individuals' choices are consistent with their values, and our desires (expectations) evolve to enhance these. Expectations remain limited to what is possible in the practical scenario, while non-traditional and non-transformative possibilities are ignored. In scenario determination, drawing the boundaries of what is imaginable poses a problem. Creating equally probable scenarios among outcomes that reflect expectations and values is more difficult. Choosing between unequally probable futures makes the decision-maker's job difficult (Miller, 2007).

Futures literacy can be possible by developing the capacity to imagine and evaluate the potential of decisions made now (Miller, 2007). It needs to be accepted by everyone that the future

cannot be imagined by a few people (Larsen et al., 2020). The future can only be imagined, so the specific context of futures literacy lies in the human imagination. Futures literacy is an ability that expresses the capacity to know how to imagine the future and what is necessary and needs to be developed (Larsen et al., 2020).

The importance of including future perspectives in the national curriculum has been emphasized by researchers in the field of education (Jónasson,2016). There are current challenges in incorporating 'future thinking' among teachers and students of futures education into schools. For this reason, Häggström and Schmidt (2021), based on the four-resource model, suggested that the stages of code-breaking, meaning-making-use, and analysis should be included in the subsequent applications of futures literacy. Miller (2007) emphasized that despite the search for greater predictive accuracy, the difficulty of assigning probabilities, or the inadequacy and failure of the search for prediction, there has been little progress in the development of practical alternatives, non-predictive imagination being more important. Spanjol et al. (2023) contributed to business schools' integration into futures literacy, including the entrepreneurs they train in business and business schools, by emphasizing the importance of creating social value, sustainability, prosperity, and resilience, to contribute positively to society. Henderson et al., (2019), For the Future, emphasized themes such as management education, responsible management education principles, and corporate social responsibility.

The potential of the present is not questioned enough. It constitutes invention poverty in terms of impact on strategic decision-making. When choosing stories about the future, inhibits critical perspective due to trust (Miller, 2007). Futures literacies are a complex combination of ways to understand, realize, celebrate, and diversify the unknown future (Horst and Gladwin, 2022). As Poli (2021) states, *when we accept that we are on the verge of disaster,* we still have a future task to develop a real strategy that will keep our hope alive. Strategists can use strategic information competently if they fulfill all their other responsibilities, especially ethical and legal (Karakaya and Çokpartal, 2023). Therefore, determining strategies for the futures requires taking into account ethical responsibilities by examining the factors that will affect the future.

3. MATERIALS and METHODS

Bibliometric analysis helps to understand the development process and future trends of a particular emerging field over the years. It is a quantitative methodology to determine the volume and growth pattern of the literature by performing performance analysis and science mapping (Guleria et al.,2021). Performance analysis can be done in two ways. The first is descriptive analysis, which describes the productivity of scientific studies, authors, journals, and countries, and the second is citation analysis, which sheds light on the most influential and influential articles, authors, journals, and countries. The scientific mapping method contributes to creating qualitative networks of articles (Van Eck 2010; Lim et al., 2022).

In the first step of the bibliometric analysis, the Scopus database was selected. Scopus database was preferred because its scope is wide, its source quality is generally accepted, and it is a reliable source for bibliometric analysis (Martín-Martín et al. 2018, Lim et al., 2022; Demir et al., 2024a).

In the second step, data was extracted from the selected database and filtered. Information about obtaining the data is given in Table 1.

Table 1. Selecting Data from the Scopus Database

In data browsing keywords used	Keyword: "future literacy" OR Article title, abstract, keyword: "future literacy" "foresight"
Document type and language	All fields – English
Publication type	Article, conference paper, book chapter
Year of publication	All years until 2023
Exclusion criteria	Non-English documents were excluded. Studies other than articles, conference papers, and book chapters were excluded

The data of the research in Table 1 was downloaded on December 03, 2023. Initially, 200 documents related to "Future literacy" were found in Scopus' "article title, abstract or keywords" criteria. When these studies were examined, it was determined that there were different studies on literacy and development, such as speech difficulties and the development of literacy in children, that were not suitable for the study. For this reason, in the first stage, a limitation was made as "future literacy" in the "keyword" criterion or "future literacy" and "foresight" in the "article title, abstract, keyword" criterion. It was limited to studies in English, and as a result, a total of 87 scientific publications, including 69 articles, 9 conference papers, and 8 book chapters, were included in the study. 1 editorial and 1 Note were excluded. As a result, on December 3, 2023, 87 documents were downloaded from Scopus in ".csv" format (documents made between 2009-2023). As stated in Scopus, documents related to futures literacy were dated between 2009 and 2023 (14 years). 30.8% of the studies were in the fields of "social sciences", 23.2% in "business, management, and accounting", 10.3% in "arts and humanities" and the remaining studies were in other fields.

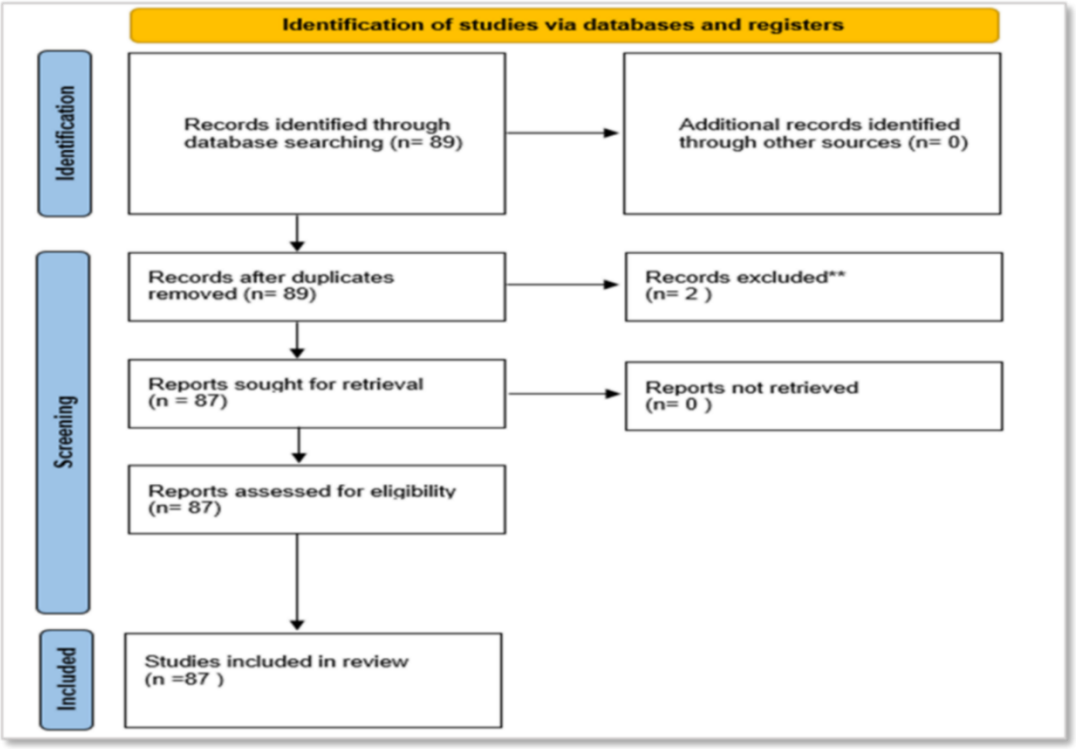

Figure 1. PRISMA Flow Diagram of Data Collection Process

Figure 1 shows the data search process in the study. A three-stage data search process was followed according to the figure; screening and eligibility were included. The final stage of bibliometric analysis includes determining the methods to be used and evaluating the data. At this stage, while evaluating and visualizing the data, VOSviewer software (Van Eck and Waltman,

2017) and R bibliometrics (Aria and Cuccurullo, 2017) library used for bibliometric analyses were preferred and analyses were carried out with the built-in Biblioshiny utility.

4. BIBLIOMETRIC ANALYSIS RESULTS of FUTURES LITERACY

4.1. Descriptive analysis of publications

This study includes evaluating publications in the field of futures literacy with a detailed descriptive analysis, examining the annual publication increase rate, and evaluating the average number of citations per publication and the average life expectancy of publications. The study shows the most published and cited authors and countries. In addition, the Three-Field Plot was used to compare the most cited publications and journals, organizations, and publication types.

4.1.1. Database overview

Basic information about Futures Literacy in the data file is shown in Figure 2. Data downloaded from Scopus were analyzed using Biblioshiny for Futures Literacy use.

Figure 2. Main Information

87 publications on Futures Literacy in 43 sources (journals, books, etc.) were analyzed from the Scopus database between 2009 and 2023. The average age of documents related to futures literacy is 2.79 years old, and publications in this field are growing at an annual rate of 20.74%. Each document in the studies receives an average of 5,506 citations. 24 of the total 215 authors worked as a single author. The international co-authorship rate of the authors is 27.59%.

4.1.2. Annual scientific production trend

As shown in Figure 3, the number of documents in the bibliometric analysis of Futures Literacy studies varies over time.

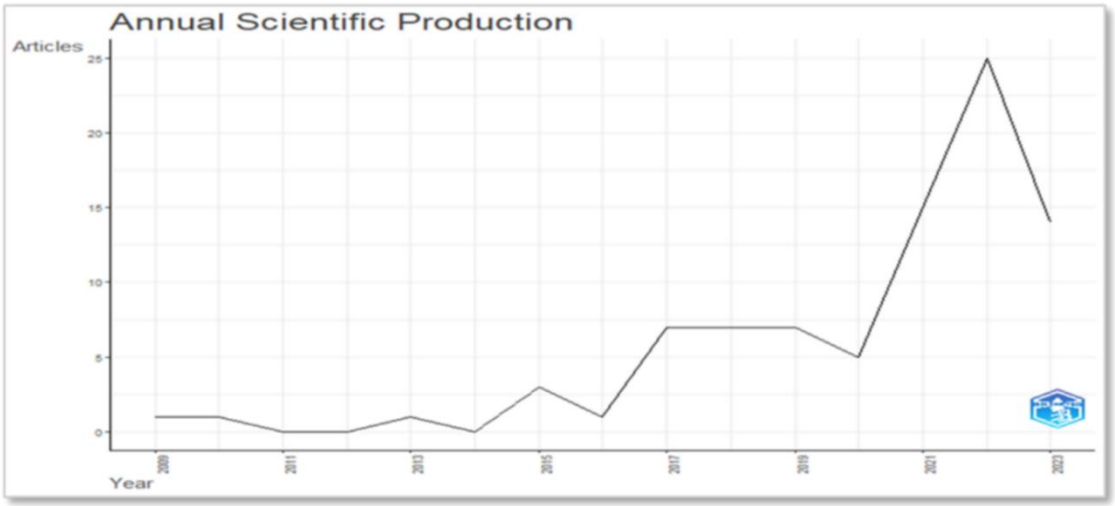

Figure 3. Distribution of Futures Literacy Studies Used in the Research by Years

According to Figure 3, it can be said that the interest among scientists around the world has varied over the years. For the number of publications, 14 broadcasts were made in 2023, 25 in 2022, 15 in 2021, and 5 in 2020. Especially in 2022, the increase in research on Futures Literacy has been the highest.

4.1.3. Annual average citation status

The status of annual citations for Future Literacy studies is shown in Figure 4.

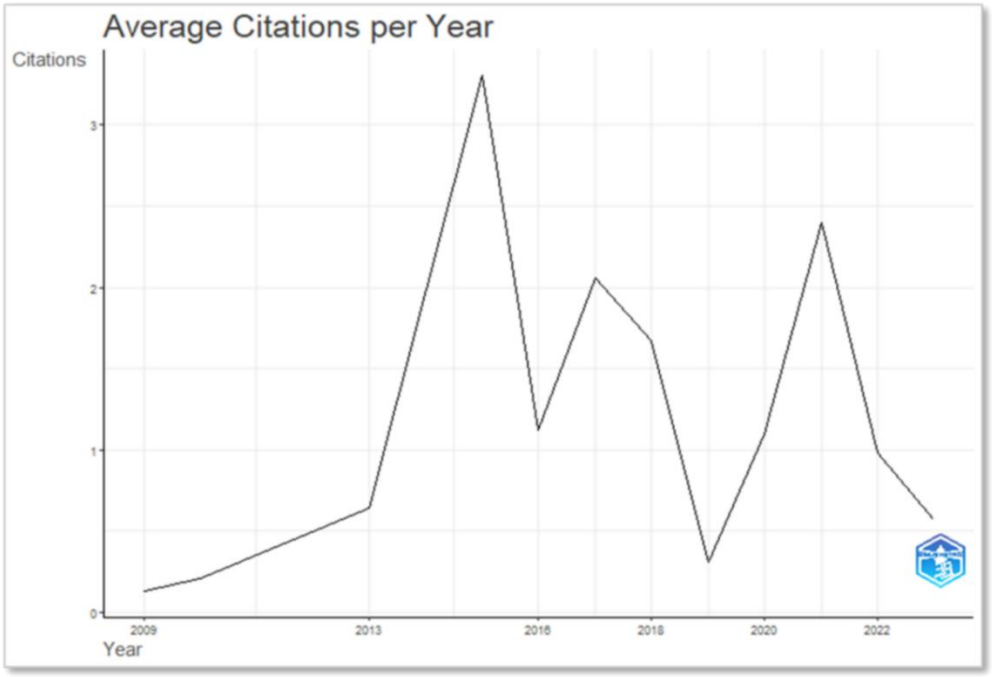

Figure 4. Annual Average Citation Trend of Futures Literacy Studies

According to Figure 4, there is a change in the number of citations to studies over the years. The average total number of citations per studies by year is 0.57 in 2023, 1.96 in 2022, and 7.2 in 2021. In studies conducted with Futures Literacy, the average number of citations per article was highest in 2015.

4.1.4. Three-Field plot in studies on futures literacy

"Three-Field Plot", the three parameters to be associated (keyword, source, and country) were set from the Biblioshiny program. The most important ones for each parameter in studies on futures literacy are shown in Figure 5.

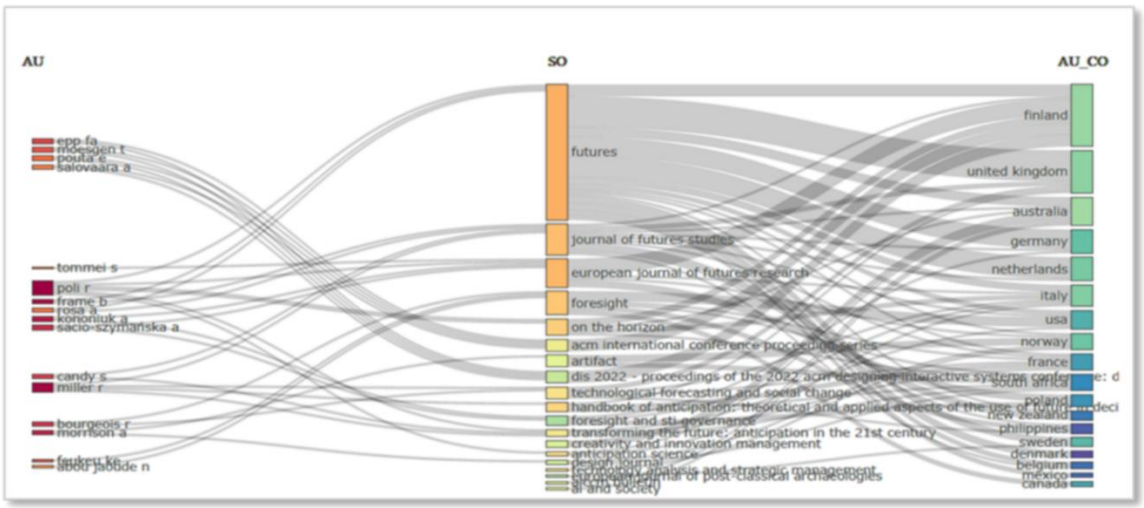

Figure 5. Three-Field Plot for Author, Source and Country

Figure 5, in the diagram also called the "Sankey diagram", was obtained by setting the 3 parameters "author, source, and country" to establish a relationship in the program. The most effective ones in the relationship between the three parameters determined in the Sankey Diagram are shown with large tiles. According to the author parameter, the leading author is “Poli R.”, according to the source parameter, the leading journal is “Futures” and Finland is the leading country.

4.1.5. Most productive sources

Figure 6 shows the ranking of resource journals on futures literacy.

Figure 6. Most Productive Journals

According to Figure 6, the "Futures" journal ranked first with 21 publications, the "European Journal of Futures Research" journal ranked second with 7 publications, and the "Journal of Futures Studies" journal with 6 publications, ranking in three of them. Table 2 lists the top 10 sources of publications on future literacy.

Table 2. The Most Productive Resources Based On H-Index in Future Literacy Studies

Source	h_index	TC	Number of documents	PY_start
Futures	8	150	21	2017
European Journal of Futures Research	4	51	7	2016
On The Horizon	3	26	4	2013
Journal of Futures Studies	2	19	6	2010
Technological Forecasting and Social Change	2	118	2	2015
Technology Analysis and Strategic Management	2	17	2	2009
Transforming The Future: Anticipation in the 21st Century	2	14	2	2018
AI and Society	1	6	1	2021
AICCM Bulletin	1	1	1	2019
Anticipation Science	1	1	2	2017

Futures (8), European Journal of Futures Research (4), and On the Horizon (3) journals are in the top three places in h-index citations. Futures (21), European Journal of Futures Research (7),

and Journal of Futures Studies (6) published the first three ranked documents. Futures (150), Technological Forecasting and Social Change (118), and the European Journal of Futures Research (51) received the most citations.

4.1.6. Most important authors

Figure 7 highlights the most relevant authors in terms of various publications worldwide.

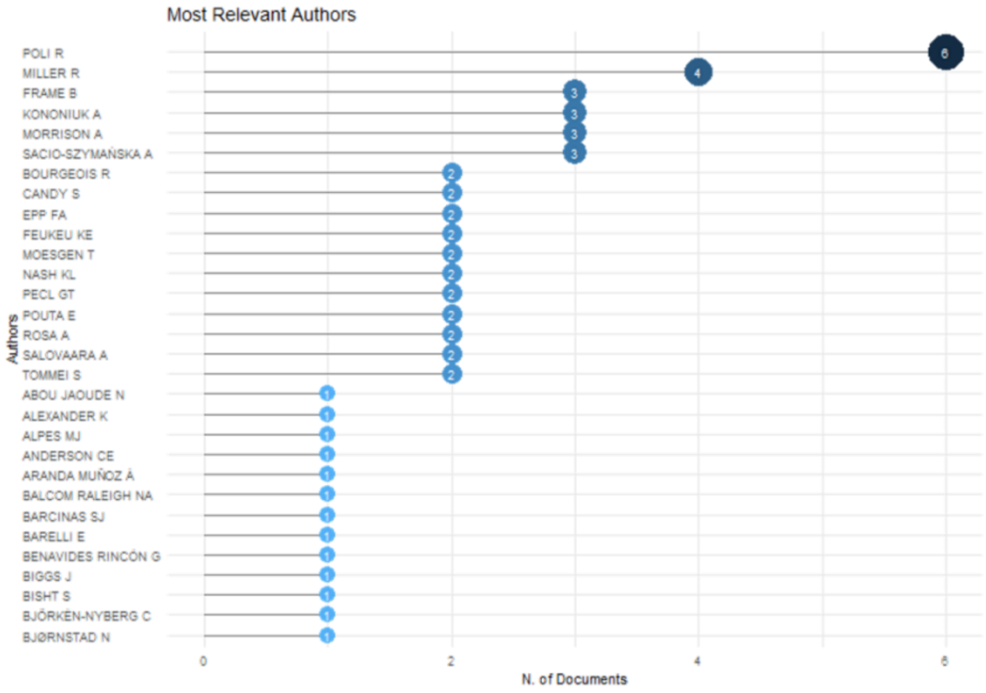

Figure 7. Most Important Authors

According to Figure 7, Poli R ranks first with 6 studies, Miller R ranks second with 4 studies, and Frame R, Konoiuk A, Morrison A, and Sacio-Szymańska A rank third with 3 studies.

4.1.7. Most Important Organizations

Organizations' publication output in Futures Literacy research is shown in Figure 8.

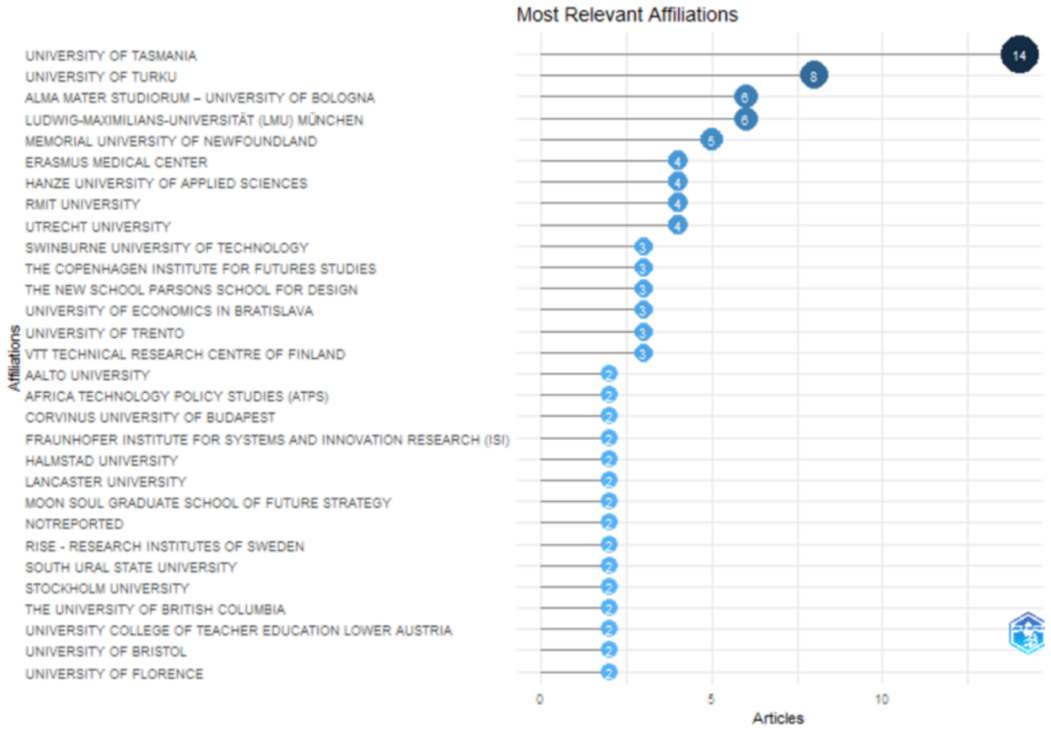

Figure 8. Organizations with the Most Publications

According to Figure 8, the most productive universities are the University of Tasmania with 14 publications, the second by the University of Turku with 8 publications, and 6 publications the third by Alma Mater Studiorum – University of Bologna and Ludwig-Maximilian-Universität München.

4.1.8. Most Productive Countries

The relationship map between the most productive countries in Table 3 and Figure 9 in the field of futures literacy and the countries in Table 4 and Figure 10 was extracted from RStudio software. The ten most cooperating countries according to various publications are shown in Table 4.

Table 3. Most Broadcast Countries

Region	Frequency
Australia	28
Finland	27
United Kingdom	18
Italy	17
Netherlands	17
Norway	13
Germany	12
Sweden	11
USA	10
Canada	9

As shown in Table 3, the 10 most productive countries in the field of Futures Literacy are shown. According to the table, Australia ranks first with 28 articles, Finland ranks second with 27 articles, and England ranks third with 18 articles.

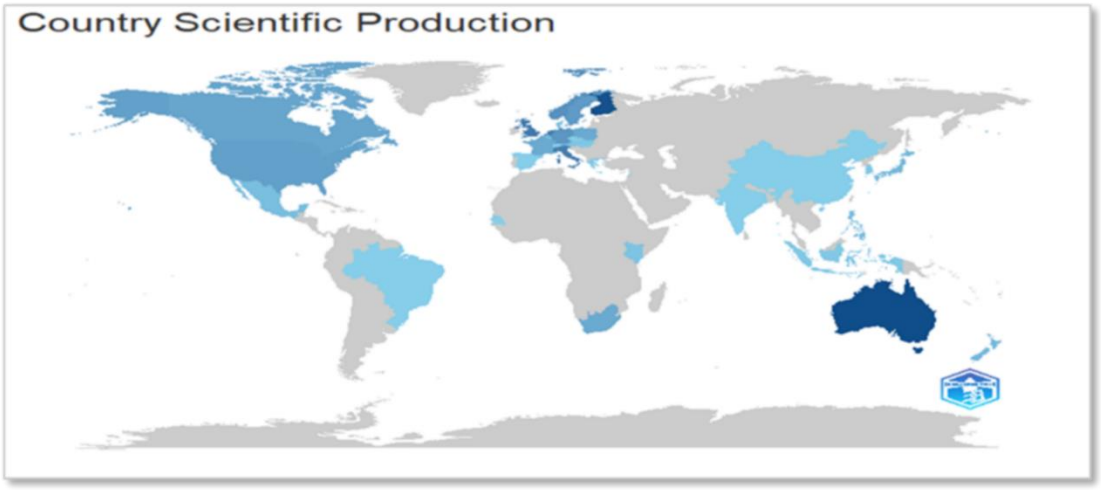

Figure 9. Countries with the Most Broadcasts

On the world map, Australia and Finland (dark blue) show the countries that broadcast the most, England, Italy, and the Netherlands (blue) show the countries that broadcast less, and gray shows the countries that do not broadcast. The ten most cooperating countries worldwide are shown in Table 4.

Table 4. The Ten Most Collaborative Countries

From	To	Frequency
United Kingdom	France	3
France	South Africa	2
Germany	Belgium	2
Norway	South Africa	2
Philippines	Indonesia	2
United Kingdom	Netherlands	2
Australia	Canada	1
Australia	USA	1
Belgium	Lebanon	1
Canada	South Africa	1

According to Table 4, the United Kingdom -France, one of the most cooperative countries, ranks first with 3 articles. While France-South Africa ranks second with 2 studies, Germany-Belgium ranks third with 2 studies. These values are shown in Figure 10, which shows a map of world cooperation.

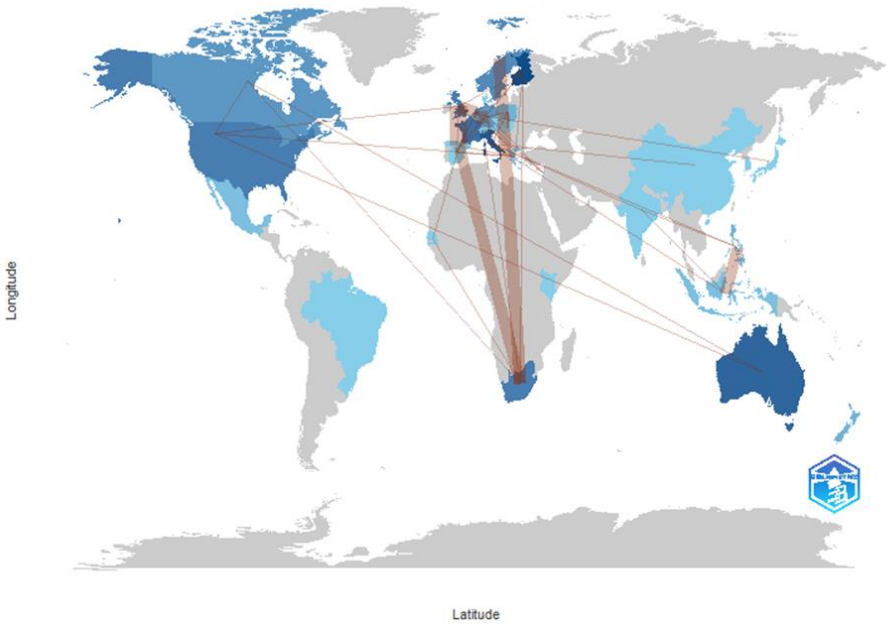

Figure 10. Cooperation Map of Countries

Countries with high connections (thick lines) are defined as those that cooperate the most with others. In studies involving futures literacy, it is seen that the United Kingdom cooperates with France and the Netherlands, respectively. According to the map, the country that cooperates the most is the United Kingdom.

Figure 11 shows the countries with the most citations.

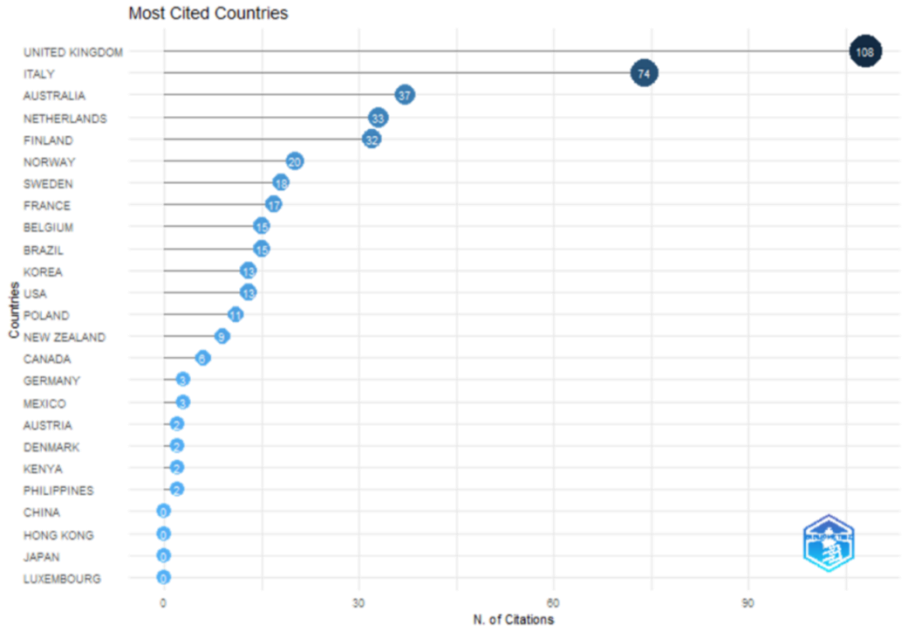

Figure 11. Most Cited Countries

According to Figure 11, in articles written in the field of futures literacy, the United Kingdom ranks first with 108 citations, Italy ranks second with 74 citations, and Australia ranks third with 37 citations.

4.1.9. Most influential articles

The most productive article is the one with the highest number of total citations (TC). Accordingly, the 20 most globally influential articles are shown in Table 5.

Table 5. Most Influential Articles

Paper	DOI	Total Citations	TC per Year	NormalizedTC
RHISIART M, 2015, TECHNOL FORECAST SOC CHANGE	10.1016/j.techfore.2014.10.015	74	8,22	2,49
BOURGEOIS R, 2017, TECHNOL FORECAST SOC CHANGE	10.1016/j.techfore.2017.04.018	44	6,29	3,05
MANGNUS AC, 2021, FUTURES	10.1016/j.futures.2021.102793	22	7,33	3,06
NASH KL, 2022, REV FISH BIOL FISH	10.1007/s11160-020-09629-5	20	10,00	10,20
MORRISON A, 2017, DES J	10.1080/14606925.2017.1352704	16	2,29	1,11
CAGNIN C, 2018, TECHNOL ANAL STRATEG MANAGE	10.1080/09537325.2017.1340638	15	2,50	1,50
FACER K, 2021, FUTURES	10.1016/j.futures.2021.102807	15	5,00	2,08
POLI R, 2015, HORIZON	10.1108/OTH-01-2015-0003	15	1,67	0,51
KUZMANOVIC M, 2017, FUTURES	10.1016/j.futures.2016.05.007	15	2,14	1,04
MOYNIHAN T, 2020, FUTURES	10.1016/j.futures.2019.102495	14	3,50	3,18
HÄGGSTRÖM M, 2021, FUTURES	10.1016/j.futures.2021.102813	14	3,5	1,94
POLI R, 2018, EUROPEAN J FUTURES RES	10.1186/s40309-018-0145-9	14	2	1,4
HEO K, 2021, EUROPEAN J FUTURES RES	10.1186/s40309-021-00179-y	13	3,25	1,80
KETONEN-OKSI S, 2018, EUROPEAN J FUTURES RES	10.1186/s40309-018-0135-y	13	1,85714286	1,3
HAYWARD P, 2017, J FUTURES STUD	10.6531/JFS.2017.22(2).A5	13	1,625	0,90
FRAME B, 2018, FUTURES	10.1016/j.futures.2018.04.005	12	1,71428571	1,2
LIANAKI-DEDOULI I, 2017, FUTURES	10.1016/j.futures.2017.03.001	11	1,375	0,76
SACIO-SZYMAŃSKA A, 2016, EUROPEAN J FUTURES RES	10.1007/s40309-016-0103-3	9	1	1
KAZEMIER EM, 2021, FUTURES	10.1016/j.futures.2021.102814	8	2	1,11
MILLER R, 2018, TRANSFORMING THE FUTURE: ANTICIPATION IN THE 21ST CENTURY	10.4324/9781351048002	8	1,14285714	0,8

The most cited is by Rhisiart et al. (2015) published in the journal Technological Forecasting and Social Change, there were 74 citations to the article titled "Learning to use the future: Developing Foresight Capabilities through Scenario Processes". This article was followed by the article "Foresight for all: Co-elaborative scenario building and empowerment" published in Technol Forecast Soc Change Journal by Bourgeois R (2017), with 44 citations, and ranked second. In third place was the article published in the Futures journal "Futures Literacy and the Diversity of the Future" created by Mangnus AC et al., (2021) with 22 citations.

Scientific mapping can be said as a set of computational techniques used to analyze data and visualize various scientific and technical activities (Demir et al., 2024a).

4.1.10. Conceptual structure map

In this section, the conceptual structure map and maps consisting of keywords based on the topic dendrogram are shown. First, a conceptual structure map is shown in Figure 12.

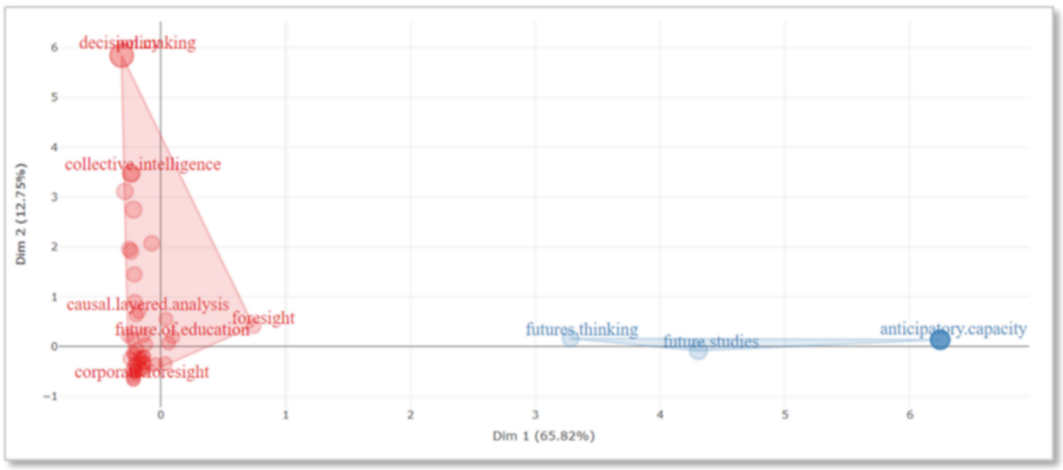

Figure 12. Futures Literacy Conceptual Structure Map

As a result of Figure 12, Conceptual structure map (factor analysis), when the keywords of the articles on future literacy are examined, it is seen that the concepts are grouped under two factors.

As a result of the conceptual structure map (factor analysis), when the keywords of the author of studies on future literacy are examined, it is seen that the concepts are collected in 2 dimensions with high factor loading. In the first dimension (red) there are words such as futures literacy, foresight, anticipation, futures studies, transformative learning, innovation, sustainability, education, anticipatory systems, business schools, collective intelligence, future of education, complexity, decision-making, empowerment, and strategic planning.

In the second dimension (blue), there are words such as futures thinking, future studies, anticipatory capacity, consequences, consequences, futures wheel, futures workshop, speculative design, and technology innovation.

4.1.11. Topic dendrogram

The diagram showing the hierarchical relationship between keywords is shown in Figure 13.

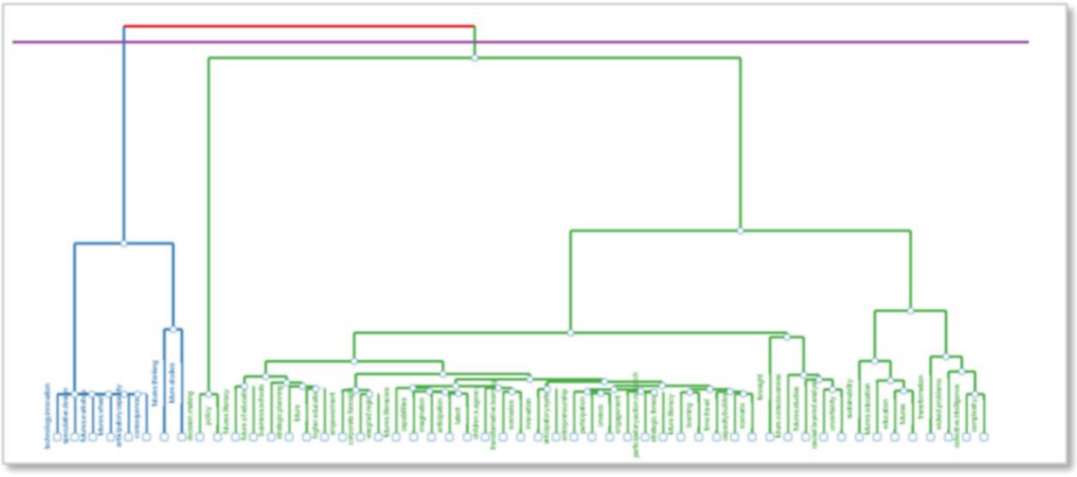

Figure 13. Topic Dendrogram of Keywords

In Figure 13, the keywords below the horizontal line (purple) drawn across the diagram are divided into 2 clusters (blue and green). Clusters describe how topics are related to each other. In the green cluster, topics such as futures literacy, foresight, anticipation, futures studies, transformative learning, sustainability, education, business schools, future of education, complexity, and decision-making constitute the basic topics. The second cluster, which meets the central cluster at this height, deals with themes such as "futures thinking, future studies,

anticipatory capacity, consequences, futures wheel, futures workshop, speculative design, technology innovation" in the blue cluster.

4.1.12. Thematic map

The thematic map is used to explain major themes and patterns. While density in thematic maps measures the consistency between nodes, centrality measures the degree of correlation between different topics (Kemeç & Altınay, 2023). A thematic review of publications related to futures literacy was conducted using bibliometrics and authors' keywords to identify the main study topics of the field. Figure 14 shows the thematic map of the keywords of the studies on futures literacy.

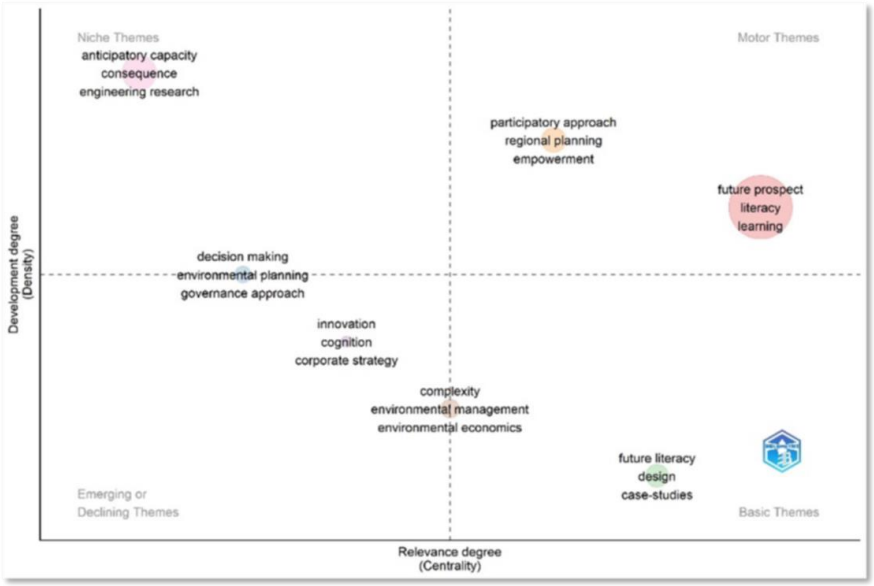

Figure 14. Thematic Map by Keywords

According to Figure 14, the most used central and common keywords in scientific studies and citations about futures literacy are in the "future prospect, literacy, learning, participatory approach, regional planning, empowerment" engine theme group. The keywords in the niche group "anticipatory capacity, consequence, engineering research" are themes where the centrality is high but the density decreases. While these keywords in the niche group were more productive in previous periods, their ties to the subject have weakened over time. However, the words “innovation, cognition, corporate strategy” are both low density and low centrality. Even though these words have low connection and relevance with other words, they show a newly emerging theme group. "Future literacy, design, and case studies" include core themes with low internal connectivity. It has high density and low centrality.

4.1.13. Trend Topics

Trend topics in the literature on futures literacy from 2009 to 2024 are presented in Table 6.

Table 6. Trend Topics

Item	Freq	Year_q1	Year_med	Year_q3
business schools	2	2023	2023	2023
future consciousness	2	2023	2023	2023
complexity	2	2020	2020	2020
transformative learning	6	2020	2021	2022
futures literacy	61	2020	2022	2022
futures studies	8	2019	2019	2021
future literacy	5	2019	2019	2022
causal layered analysis	2	2019	2020	2021
innovation	5	2019	2021	2022
foresight	15	2019	2022	2022
sustainability	5	2019	2023	2023
collective intelligence	2	2018	2018	2018
entrepreneurship	2	2018	2019	2020
futures literacies	4	2018	2020	2022
education	4	2018	2022	2022
bertrand de jouvenel	1	2017	2017	2017
capability	1	2017	2017	2017
climate change	1	2017	2017	2017
scenario	2	2017	2018	2018
anticipation	13	2017	2021	2022
corporate foresight	2	2016	2016	2017
latent	2	2016	2016	2016
visegrad region	2	2016	2016	2017
learning	2	2016	2018	2020
abstract future	1	2015	2015	2015
eleonora masini	1	2015	2015	2015
richard slaughter	1	2015	2015	2015
awakening	1	2013	2013	2013
civilizational crisis	1	2013	2013	2013
economic sustainability	1	2013	2013	2013
decision-making	2	2012	2014	2017
policy	2	2012	2014	2017
wicked problems	2	2012	2014	2016
capability building	1	2010	2010	2010
futures capability	1	2010	2010	2010
integrated research	1	2010	2010	2010
municipal planning	1	2009	2009	2009
stakeholder	1	2009	2009	2009
visioning	1	2009	2009	2009

According to Table 6, the words "business schools" and "future consciousness" are the most popular in 2023. The popular word of 2020 was "complexity". The word “transformative learning” ranked third with a total of 6 references in the first quarter of 2020, the second quarter of 2021, and the third quarter of 2022. Words such as “business schools”, “future awareness”, “transformative learning”, “causal layered analysis”, “education”, “scenario”, “learning”, and “skill development”, demonstrate research methods of futures literacy. Additionally, words such as "Business schools,

transformative learning, innovation, foresight, sustainability, decision-making, capability building" show that they are variables used by researchers.

The large rectangles of the tree map show the relative sizes of keywords used in futures literacy-related articles and the number of articles in which they appear. A tree map of the keywords generated according to Figure 15 is given.

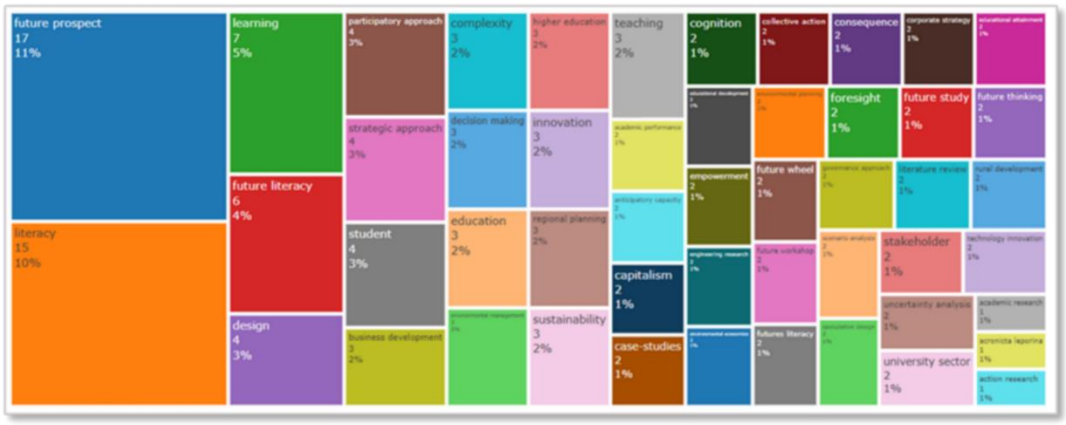

Figure 15. Tree Map of Keywords

According to Figure 15, among the keywords, the term "future prospect 11%" is seen in most of the publications, as shown in the blue rectangle. As shown in the orange rectangle, “literacy 10%” was the second most used word, followed by learning and future literacy. 3% of the documents consist of design, participatory approach, strategic approach, and student. Other words appear to consist of words such as sustainability, complexity, decision-making, education, and innovation.

In addition, by creating a 100-word criterion through Biblioshiny, the keywords used in the research and their frequencies were determined as follows: “future prospect (17), literacy (15), learning (7), future literacy (6), design (4), participatory approach (4), strategic approach (4), student (4), business development (3), complexity (3), decision making (3), education (3), environmental management (3), higher education (3), innovation (3), regional planning (3), sustainability (3), teaching (3), academic performance (2), anticipatory capacity (2), capitalism (2), case-studies (2), cognition (2), collective action (2), consequence (2), corporate strategy (2), educational attainment (2), educational development (2), empowerment (2), engineering research (2), environmental economics (2), environmental planning (2), foresight (2), future study (2), future thinking (2), future wheel (2), future workshop (2), futures literacy (2), governance approach (2), literature review (2), rural development (2), scenario analysis (2), speculative design (2), stakeholder (2), technology innovation (2), uncertainty analysis (2), university sector (2), academic research (1), acronicta leporina (1), action research (1), adaptation process (1), adaptive capacity (1), africa (1), agricultural robots (1), agriculture (1), alternative future (1), anthropocene (1), anthropology (1), anticipation (1), article (1), artificial intelligence (1), artificial intelligence technologies (1), business model innovation (1), business model innovation process (1), capability (1), capacity building (1), child (1), chinese context (1), citizenship (1), co-designing (1), collaborative design (1), competence development (1), computer aided instruction (1), conceptual framework (1), conceptual levels (1), conversation (1), corporate foresight (1), covid-19 (1), creative writings (1), critical analysis (1), cultural heritage (1), culture (1), demand analysis (1), democracy (1), design activity(1), design method (1), development strategy (1), diamond model(1), dynamic capabilities(1), earth science (1), economic policy (1), entrepreneurship (1), environmental policy (1), environmental research (1), equity (1), extinction (1), first second and third persons (1), fishery management (1), forecasting method (1), foresight maturity (1)”.

When these words are examined, they include studies related to technology, education, and environment-oriented disciplines, processes such as education, planning, and decision-making, and concepts related to research methods such as future-oriented, innovation and development, and uncertainty analysis.

4.1.14. Co-occurrence-keywords analysis

As shown in Figure 16, at least one keyword criterion was set in the VOSviewer software with the co-occurrence and author keywords options and taken into account for analysis.

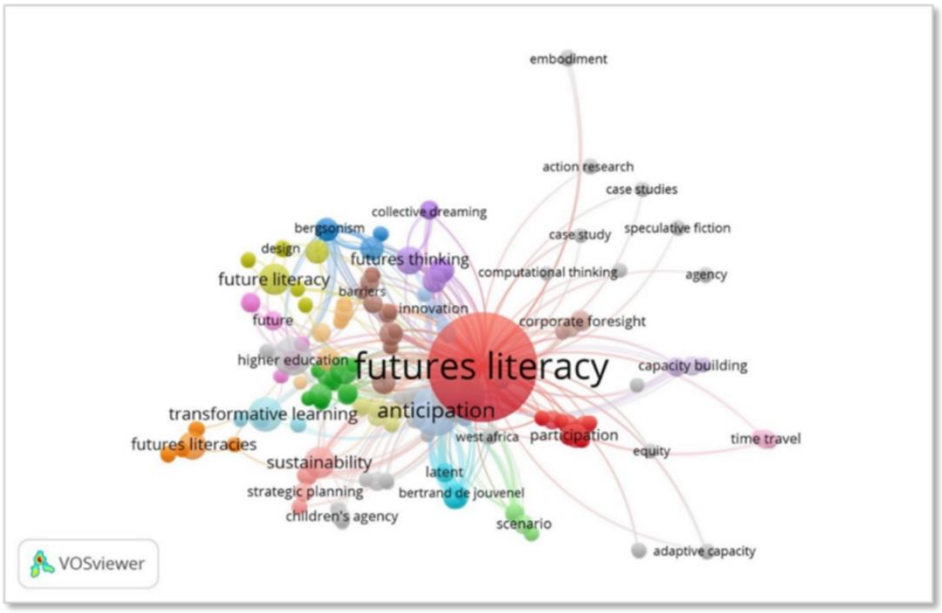

Figure 16. Network Map of the Most Used Keywords

According to Figure 16, the most used keywords were repeated 61 times, futures literacy, 15 times, and anticipation 13 times, respectively. Using VOSviewer software, the "Overlay visualization" technique was used to bring together keywords with different colors corresponding to the year of publication. According to Figure 17, the colors of the items are based on the time since they were published.

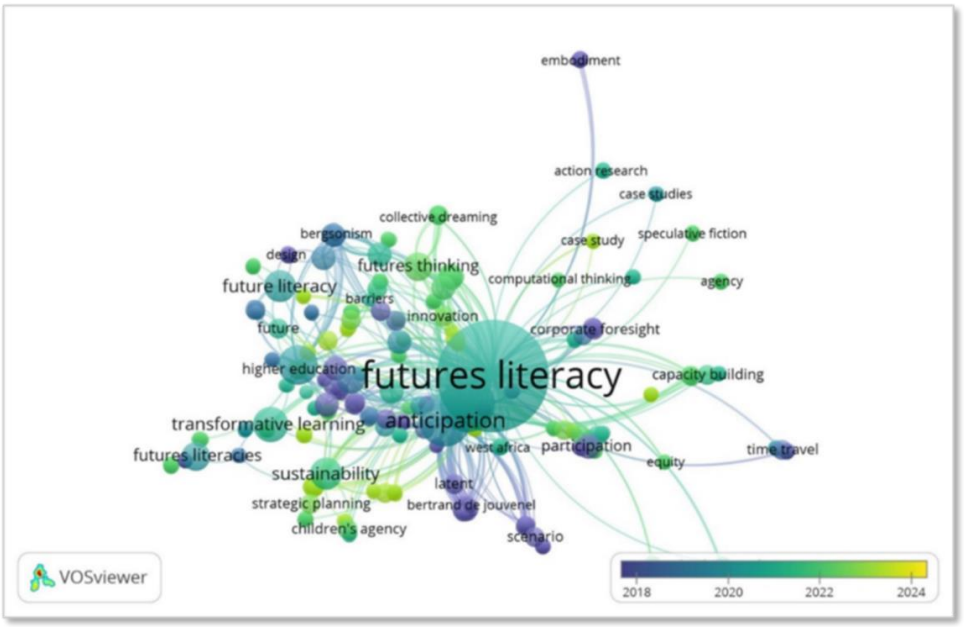

Figure 17. Use of Keywords Over Time

Figure 17 shows the usage of keywords over time. According to the figure, three words such as future education, decision making, and scenario were used between 2018 and 2020 (dark blue and blue). Between 2020 and 2022, words such as (green) anticipation, futures thinking, and futures studies were used. Between 2022 and 2024, words such as (yellow) engagement, business schools, and future-proof teacher were used.

5. DISCUSSION

In this study, by searching the Scopus database on future literacy, 87 studies between 2009 and 2023 were found to be suitable for bibliometric analysis. Scientific studies on futures literacy have continued to increase throughout the process. The increase in the number of publications may be due to UNESCO's support for the Future Literacy Program in 2012 (Jennische and Sörbom, 2023). Bibliometrix analysis was not found within the scope of studies on futures literacy. In research on futures literacy, it has been observed that mostly case studies, scenario studies, and prediction models are used.

To the authors' knowledge, this study is the first bibliometric analysis on futures literacy. Especially in 2022, the increase in research on future literacy was at the highest level.24 authors worked alone on futures literacy. The average lifespan of each publication was found to be 2.1 years, the average citations to publications were 5,506, and the average growth rate of publications was 20.74% annually. While Finland is the most important country in futures literacy on publications (according to the Sankey diagram), the author “Poli R.” was the best, the first leading journal “Futures”.

Academic cooperation between different countries can be a guide in disseminating knowledge and promoting academic exchange (Kemeç and Altınay, 2023). As a result of the analysis, Australia, Finland, and England were determined to be the leading and most productive countries in scientific publications in this field. Among the most cited countries: England, Italy, and Australia are among the top three. England, France, and the Netherlands, which have high connections, are the countries that cooperate the most. The countries that cooperated the most worldwide were England-France, France-South Africa, and Germany-Belgium, respectively.

According to collaboration between authors, the countries with the highest number of documents are Finland, Italy, and France; the most cited countries according to collaboration between authors are England, France, and Italy; according to the collaboration between authors, the countries with the highest total connection strength were determined to be France, South Africa, and the United Kingdom. Accordingly, France ranked in the top 3 among these countries in terms of number of documents, links, and citation rankings.

The best journals in the field of futures literacy; Futures, European Journal of Futures Research, and On the Horizon journals have attracted increasing attention from researchers, especially from Australia, Finland, and the UK. Futures, European Journal of Futures Research, and On the Horizon journals ranked in the top three in h-index citations. Futures, European Journal of Futures Research, and Journal of Futures Studies emerged as the 3 most published journals. Futures, Technological Forecasting, and Social Change, the European Journal of Futures Research received the most citations.

The most cited article is the article titled "Learning to use the future: Developing foresight capabilities through scenario processes", published in Technol Forecast Soc Change journal by Rhisiart M et al., (2015). In second place is “Foresight for all: Co-elaborative scenario building and empowerment” published by Bourgeois R et al., (2017) in the Technol Forecast Soc Change journal. In third place, “Futures literacy and the diversity of the future” created by Mangnus AC et al., (2021) is the most influential article published in the Futures journal.

The most important authors in this field are Poli R, Miller R, Frame R, Konoiuk A, Morrison A, and Sacio-Szymańska A, respectively, who are the most relevant authors in terms of various publications worldwide. With this study, "University of Tasmania", "University of Turku, Alma mater studıorum - University of Bologna" and "Ludwig-Maximilians-Universität (LMU) München" emerged as the universities that contributed the most in terms of the number of studies.

The topic dendrogram of keywords in the futures literacy field consists of two clusters. Topics such as "futures literacy, foresight, anticipation, futures studies, transformative learning, sustainability, education, business schools, future of education, complexity, decision making" constitute the basic topics. The second-dimension deals with themes such as "futures thinking, future studies, anticipatory capacity, consequences, consequences, futures wheel, futures workshop, speculative design, technology innovation". When these two dimensions are evaluated in general, the first dimension can be named future literacy in business schools and education in general, including sustainability, and the second dimension can be called practical studies aimed at discovering the ability or capacity of future literacy. Accordingly, the tendency for future research is to focus on words in these two dimensions.

In scientific studies, the words future prospect, literacy, learning, participatory approach, regional planning, and empowerment are the most important (motor themes) keywords used by the authors. The newly emerging theme group in the keywords was created by the words "innovation, cognition, corporate strategy". The words “anticipatory capacity, consequence, engineering research” were determined to be niche themes studied in more depth by the authors.

Trending topics in research: "business schools, future consciousness, complexity, transformative learning, futures literacy, futures studies, future literacy, causal layered analysis, innovation, foresight, sustainability, collective intelligence, entrepreneurship, futures literacies, education, bertrand de jouvenel, capability , climate change, scenario, anticipation, corporate foresight, latent, visegrad region, learning, abstract future, eleonora masini, richard slaughter, awakening, civilizational crisis, economic sustainability, decision-making, policy, wicked problems, capability building, futures capability, It was determined as "integrated research, municipal planning, stakeholder, visioning".Words such as “business schools”, “future awareness”, “transformative learning”, “causal layered analysis”, “education”, “scenario”, “learning”, and “skill development”, demonstrate research methods of futures literacy. Additionally, words such as "Business schools, transformative learning, innovation, foresight, sustainability, decision-making, capability building" show that they are variables used by researchers.

The findings and concepts in this research are also supported by research. These concepts show how futures literacy can play a role in future education and business. By internalizing these concepts, business schools and educational institutions can contribute to more effectively preparing individuals and society for the future challenges they may face. For example, as stated by Miller (2007), focusing on predicting the future provides limited benefit in developing practical alternatives and emphasizes the importance of imagination. Additionally, Spanjol et al., (2023), who argue that business schools should contribute positively to society, emphasized transforming business education by focusing on issues such as social value creation and sustainability. Accordingly, it can be thought that focusing on concepts such as social values and sustainability may be more effective in shaping our future decisions. Henderson et al., (2019) stated that the principles of future thinking and corporate social responsibility should be emphasized in management education. At this point, business schools need to encourage entrepreneurship and innovation to meet the needs future. Therefore, integrating business schools into future literacy can help both individuals and society prepare more consciously for the future. Our findings may

play an important role in determining future education policies and reorganizing educational curricula. In particular, the need to include future perspectives in the national curriculum should be taken into account, as emphasized by Jónasson (2016). This could be an important step in creating an education system where future generations will internalize sustainability, collective intelligence, and transformation. Liveley (2022) contributed to discussions about the future of ethical AI by defining the concept of "ethical AI future literacy." This aims to develop the ability to understand, analyze, and adapt to future challenges. In this context, future literacy plays an important role in the process of providing information and creating governance programs to meet the challenges of the future. For example, in areas of global challenge such as climate policy, bioethics, and nanotechnology, futures literacy can contribute to the development of reflective and anticipatory governance programs. For businesses, when futures literacy and design thinking are combined, a collective change can be activated in businesses' relationships with their customers, applied processes and strategic work. As stated by Cagnin (2018), the way to achieve expected results is through understanding the premises one uses to imagine the future. In this context, futures literacy and design thinking can provide an effective approach for organizations when creating their strategic plans for the future.

These studies, similar to our findings, support that it plays an important role in the process of providing information and creating governance programs to meet the challenges of the future.

As a result, future literacy offers a complex combination of understanding, exploring, celebrating and diversifying the future (Horst and Gladwin, 2022). Moreover, although achieving the strategic goals of the future is important, it is often not enough. Effective strategies are about preparing the future" rather than being ready for the future (Karakaya and Çokpartal, 2023).

This study provides current information for future research on futures literacy. This bibliometric research provides valuable data for assessing future literacy regarding the most influential studies in the existing literature. This study provides practitioners and researchers with a comprehensive understanding of futures literacy and guides future research directions.

This study is limited to the Scopus database for publications in the field of futures literacy. First, the Scopus database was used in this study, databases such as Web of Since, Pubmed, and Dimensions were excluded. Secondly, it is limited to scientific studies (articles, conference papers, book chapters) published in English on futures literacy from the Scopus database. Future research could use different databases, articles alone, or other scientific studies along with articles, and studies in different languages.

CONCLUSIONS AND FUTURE IMPLICATIONS

This study provides up-to-date information to professionals, academics, and students that they can apply in future studies within the scope of "futures literacy". It has been observed that publications on futures literacy are generally dominated by "scenario studies".

The United Kingdom leads in international collaboration efforts as the most cited country. "Poli R." was determined as the most published author. Journals such as "Futures", "European Journal of Futures Research" and "Journal of Futures Studies" stand out among the most published ones. The most frequently used keywords include "future prospect", "literacy" and "learning".

This work shows how futures literacy can play a role in future education and business. By internalizing these concepts, business schools and educational institutions can contribute to more effectively preparing individuals and society for the future challenges they may face. Our findings may play an important role in determining future education policies and reorganizing educational

curricula. Based on the research findings, it can be suggested that organizations should focus on future literacy and design thinking when creating their strategic plans for the futures. It can also be suggested that prioritizing social values and sustainability should be taken into consideration when shaping our future decisions.

Developing interdisciplinary studies that will contribute to developing the field of futures literacy can create important opportunities for future scientific studies such as increasing the collaboration of authors, creating scales, conducting empirical research, developing decision models, and creating business life. Futures Literacy is among today's trending topics that tend to evolve. Many countries have not yet worked on this subject. Studies in the field of futures literacy focus on sustainable futures such as designing the future, business development, and education. The development of studies in this field will make significant contributions to determining future strategies and developing and implementing policies. Leaving a livable world and protecting the environment and nature is possible by understanding the whole system and the relationships between subsystems. This can be possible by imagining, designing, and preparing for the future.

Today's needs shape our future-oriented life. As we move towards our goals, today's needs trigger future changes and give clues about the aspects of the future that await us. This imposes responsibility for current and future generations. Our ability to shape the future world and predict the future is closely linked to today's needs. Future literacy efforts combine to leave a more sustainable world to future generations. The task of supporting these efforts, seizing opportunities, or preventing threats begins with the responsibility of current generations.

REFERENCES

Aria, M., & Cuccurullo, C. (2017). Bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of informetrics, 11*(4), 959-975. https://doi.org/10.1016/j.joi.2017.08.007

Bourgeois, R., Penunia, E., Bisht, S., & Boruk, D. (2017). Foresight for all: Co-elaborative scenario building and empowerment. *Technological Forecasting and Social Change, 124*, 178-188. https://doi.org/10.1016/j.techfore.2017.04.018

Cagnin, C. (2018). Developing a transformative business strategy through the combination of design thinking and futures literacy. *Technology Analysis & Strategic Management*, *30*(5), 524-539. https://doi.org/10.1080/09537325.2017.1340638

Demir, G., Chatterjee, P., & Pamučar, D. (2024a). Sensitivity analysis in multi-criteria decision-making: A state-of-the-art research perspective using bibliometric analysis. *Expert Systems with Applications, 237*, 121660. https://doi.org/10.1016/j.eswa.2023.121660

Demir, G., Chatterjee, P., Zakeri, S., & Pamučar, D. (2024b). Mapping the evolution of multi-attributiveborder approximation area comparison (MABAC) method: A bibliometric analysis. *Decision Making: Applications in Management and Engineering, 7*(1) 290-314. https://doi.org/10.31181/dmame7120241037

Dmi, G., Chatterjee, P., & Pamučar, D. (2024a). Sensitivity analysis in multi-criteria decision-making: A state-of-the-art research perspective using bibliometric analysis. *Expert Systems with Applications, 237*, 121660. https://doi.org/10.1016/j.eswa.2023.121660

Dmi, G., Chatterjee, P., Zakeri, S., & Pamučar, D. (2024b). Mapping the evolution of multi-attributiveborder approximation area comparison (MABAC) method: A bibliometric analysis. *Decision Making: Applications in Management and Engineering, 7*(1) 290-314. https://doi.org/10.31181/dmame7120241037

Guleria, D., & Kaur, G. (2021). Bibliometric analysis of ecopreneurship using VOSviewer and RStudio Bibliometrix, 1989–2019. *Library Hi Tech, 39*(4), 1001-1024. https://doi.org/10.1108/LHT-09-2020-0218

Häggström, M., & Schmidt, C. (2021). Futures literacy–to belong, participate and act!: an educational perspective. *Futures, 132*, 102813. https://doi.org/10.1016/j.futures.2021.102813.

Henderson, L.H., Wersun, A., Wilson, J., Yeung, S.M., & Zhang, K. (2019). Principles for responsible management education in 2068. *Futures, 111*, 81-89. https://doi.org/10.1016/j.futures.2019.05.005

Horst, R., & Gladwin, D. (2022). Multiple futures literacies: An interdisciplinary review. *Journal of Curriculum and Pedagogy,* 1-23. https://doi.org/10.1080/15505170.2022.2094510

Jennische, U., & Sörbom, A. (2023). Governing anticipation: UNESCO making humankind futures literate. *Journal of Organizational Ethnography, 12*(1), 105-119. https://doi.org/10.1108/JOE-10-2021-0055

Jenssen, S. (2009). Foresight and governance: how good can it get? The case of stakeholder image construction in a municipal vision project. *Technology Analysis & Strategic Management, 21*(8), 971-986. https://doi.org/10.1080/09537320903262397

Jónasson, J.T. (2016). Educational change, inertia and potential futures. *European Journal of Futures Research, 4*(1), 1-14. https://doi.org/10.1007/s40309-016-0087-z

Kray, A., & Çokportal, E.Ş. (2023). Stratejik Bilgi Sistemlerinin Gerekliliği Üzerine Kavramsal Bir Çalışma. *Ekonomi İşletme ve Yönetim Dergisi, 7*(1), 99-126. https://doi.org/10.7596/jebm.30062023.004

Karakaya, A., & Çokportal, E.Ş. (2023). Stratejik Bilgi Sistemlerinin Gerekliliği Üzerine Kavramsal Bir Çalışma. *Ekonomi İşletme ve Yönetim Dergisi, 7*(1), 99-126. https://doi.org/10.7596/jebm.30062023.004

Kemeç, A., & Altınay, A.T. (2023). Sustainable energy research trend: A bibliometric analysis using VOSviewer, RStudio bibliometrix, and CiteSpace software tools. *Sustainability, 15*(4), 3618. https://doi.org/10.3390/su15043618

Liveley, G. (2022). AI Futures Literacy. *IEEE Technology and Society Magazine*, *41*(2), 90-93. DOI: 10.1109/MTS.2022.3173357

Larsen, N., Kæseler Mortensen, J., & Miller, R. (2020). What is futures literacy and why is it important. Scenario. Date of access: 24 Aralık 2023. https://medium.com/copenhagen-institute-for-futures-studies/what-is-futures-literacy-and-why-is-it-important-a27f24b983d8

Lim, W.M., Rasul, T., Kumar, S., & Ala, M. (2022). Past, present, and future of customer engagement. *Journal of Business Research, 140,* 439-458. https://doi.org/10.1016/j.jbusres.2021.11.014

Mangnus, A.C., Oomen, J., Vervoort, J.M., & Hajer, M.A. (2021). Futures literacy and the diversity of the future. *Futures, 132,* 102793. https://doi.org/10.1016/j.futures.2021.102793

Martín-Martín, A., Orduna-Malea, E., Thelwall, M., & López-Cózar, E.D. (2018). Google Scholar, Web of Science, and Scopus: A systematic comparison of citations in 252 subject categories. *Journal of informetrics*, *12*(4), 1160-1177. https://doi.org/10.1016/j.joi.2018.09.002

Miller, R. (2007). Futures literacy: A hybrid strategic scenario method. *Futures*, *39*(4), 341-362. https://doi.org/10.1016/j.futures.2006.12.001

Miller, R. (2015). Learning, the future, and complexity. An essay on the emergence of futures literacy. *European Journal of Education, 50*(4), 513-523. https://doi.org/10.1111/ejed.12157

Miller, R. (Ed.) (2018). *Transforming the future: Anticipation in the 21st century.* UNESCO Publishing, Paris.

Poli, R. (2021). The challenges of futures literacy. *Futures, 132*, 102800. http://library.oapen.org/handle/20.500.12657/30271

Rhisiart, M., Miller, R., & Brooks, S. (2015). Learning to use the future: developing foresight capabilities through scenario processes. *Technological Forecasting and Social Change, 101*, 124-133. https://doi.org/10.1016/j.techfore.2014.10.015

Rowsell, J., & Pahl, K. (2007). Sedimented identities in texts: Instances of practice. *Reading research quarterly, 42*(3), 388-404. https://doi.org/10.1598/RRQ.42.3.3

Spanjol, J., Rosa, A., Schirrmeister, E., Dahl, P., Domnik, D., Lindner, M., Kuhlmann, J.F. (2023). The potential of futures literacy for impact-oriented business schools. *Futures*, *146*, 103084. https://doi.org/10.1016/j.futures.2022.103084

Van Eck, N. J., Waltman, L., Dekker, R., & Van Den Berg, J. (2010). A comparison of two techniques for bibliometric mapping: Multidimensional scaling and VOS. *Journal of the American Society for Information Science and Technology, 61*(12), 2405-2416. https://doi.org/10.1002/asi.21421

Van Eck, N.J., & Waltman, L. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics, 111*, 1053-1070. https://doi.org/10.1007/s11192-017-2300-7