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## A Scientometric Analysis of Fifty-One Years of Research on Knowledge Society (1970-2021)

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# A Scientometric Analysis of Fifty-One Years of Research on Knowledge Society (1970-2021)

## Abstract

**Purpose** - This paper aims to examine the trends of Knowledge society (KS) research, discuss the knowledge structure and analyze the current research hot spots in KS field for the period 1970-2021.

**Design/methodology/approach** – The bibliographic data of 3108 scientific documents indexed in the Scopus database were retrieved for the period 1970 to 2021 (till March). Two data analytics and visualization software i.e., VOSviewer (VV) - desktop app and Biblioshiny - a web-interface for Bibliometrix R-package was used to explore and understand the various bibliometric and scientometric indicators including prolific authors, affiliations, cited documents, co-authorship and co-citation analysis apart from network mapping.

**Findings** – The findings indicated a positive growth trend in the publications from 2004 to 2013 followed by a decline. The top contributing author was Garcia-Penalvo, F.J. (University of Salamanca, Spain). The three-fold analysis of KS publications revealed that the institutions from Spain published more on the topics related to KS research. “Communications in Computer and Information Science” found to be the core journal in which most of the KS literature has been published.

**Originality/value** - The insights accumulated from this study will provide stakeholders a glimpse of the contributions and advancement of “Knowledge Society” field and bring forth the directions for future scientific endeavors.

**Keywords** - Knowledge Society, Scientometric, Co-authorship, Co-citation, VOSviewer, Bibliometrix

**Paper type** - Research paper

## Introduction

The idea of a knowledge society dates back to the dawn of civilization. The innovation and development in the last few decades cause the transition of Agrarian society to Industrial society and further leads to the emergence of knowledge society. The term knowledge society was first coined by Peter F. Drucker in 1969 (Drucker, 1969). The global transformations of contemporary societies rely heavily on information and knowledge. While information refers to the technological possibilities of the digital age, the concept of knowledge society focuses on the issues and solutions for making sense of information. These societies have demonstrated a superior ability to leverage the knowledge resources that exist within them (Krohn, 2001). The term ‘knowledge society’ is commonly used to refer the advanced economy where majority of operations are knowledge-based (Hearn and Rooney, 2002). In an era of globalization and competitiveness, Knowledge is created and evaluated as an asset and a valuable economic resource by a highly efficient and visible group of knowledge experts. Regional and national governments have turned to knowledge as a strategic asset for sustainable economic advantage. The creation and transferring of knowledge is vital for individual and organizational success (Kumar and Mohindra, 2015). Individuals, groups and countries benefit from knowledge societies, which include social, ethical, and political elements. Singapore, for example, began as a developing country with shantytowns upon independence and by encouraging knowledge and creativity, produced economic development rates that exceeded those of most developed nations in just four decades. Knowledge societies have the following characteristics: they are part of the knowledge economy, they have a high absorption capacity, they have structures and cultures that facilitate frictionless knowledge diffusion and sharing, they go through a complex chain of reaction production and distribution including inter-functional collaboration, and they are long-term learning communities with a focus on innovation (UNESCO, 2017)

### *Definition:*

“Knowledge society is a society that generates, processes, shares and makes knowledge available to all its members. It is a society in which the creation, dissemination and utilization of information and knowledge are the most important factors of production. Intellectual capital is the most powerful producer of wealth in societies” (Tweheyo, 2021).

“A new society formed as a result of the contemporary societal change pushed by technological innovation and institutional transformation, which is not only about technological innovations, but also about human beings, their personal growth and their individual creativity, experience and participation in the generation of

knowledge. The primary role in a knowledge society is to ensure that its knowledge sources are passed on and advanced by each generation” (Yigitcanlar, 2015).

“Advanced societies reaching a stage of development predominantly based on production and utilization of knowledge” (Zacher, 2015).

### *UNESCO and Knowledge Societies*

Organization strives to promote inclusive knowledge societies and empower local communities by expanding access to, preservation of, and sharing of information and knowledge. Knowledge societies, according to UNESCO, must be built on four pillars (<https://en.unesco.org/themes/building-knowledge-societies>)



**Figure 1.** Four Pillars of Knowledge Society

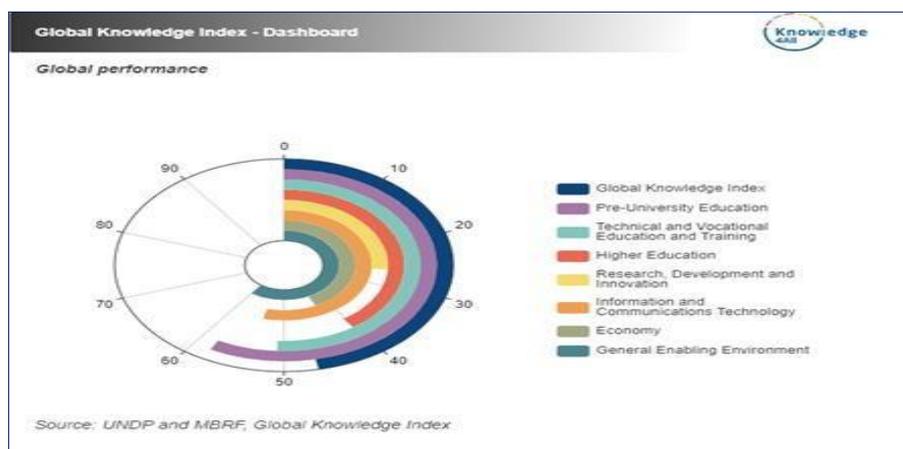
Figure 1. depicts those human rights and fundamental freedom, especially freedom of expression, should be at the heart of knowledge societies. They should also ensure that the right to education and all cultural rights are fully realized. Production and diffusion of educational, scientific, and cultural materials, preservation of the digital heritage, and teaching & learning quality should all be considered critical factors in knowledge societies.

### **Global Knowledge Index (GKI) 2020**

The GKI from Knowledge4All initiative is a flagship product of the partnership between the United Nations Development Programme (UNDP) and the Mohammed Bin Rashid Al Maktoum Knowledge Foundation (MBRF). GKI has been produced annually since 2017 covering 138 countries and 199 indicators (<https://www.undp.org/publications/global-knowledge-index-2020>). The aim is to capture the multidimensional nature of knowledge and measures the knowledge performance of countries based on seven components: Pre-University education, Technical and vocational education and training, Higher education, Research, development and innovation, Information and communications technology, Economy and the General enabling environment. GKI guides the policymakers, researchers, civil society and private sectors to collaborate and gives a more meaningful and insightful exploration on different aspects of knowledge policies to propel economic growth and development, fostering knowledge-based societies and bridge knowledge gaps. The GKI has emerged as a replacement to the World Bank's well known Knowledge Economy Index, 2012. Whereas the World Bank index was primarily focused on the dimensions that directly related to the knowledge economy formation, the GKI goes beyond the economic aspect and encompasses the factors of innovation,

economy, education and the enabling environment. Knowledge4all also allows users to discover knowledge products anytime anywhere through its Android and an iOS app (<https://www.knowledge4all.com/en/Home>). A few of the GKI analytics and visualizations have been illustrated as under:

a) *Global Performance* : The dashboard in fig.2 highlights a general overview of the GKI 2020 indicators. It visualizes the knowledge dimensions within and across countries.



**Figure 2.** Global Performance

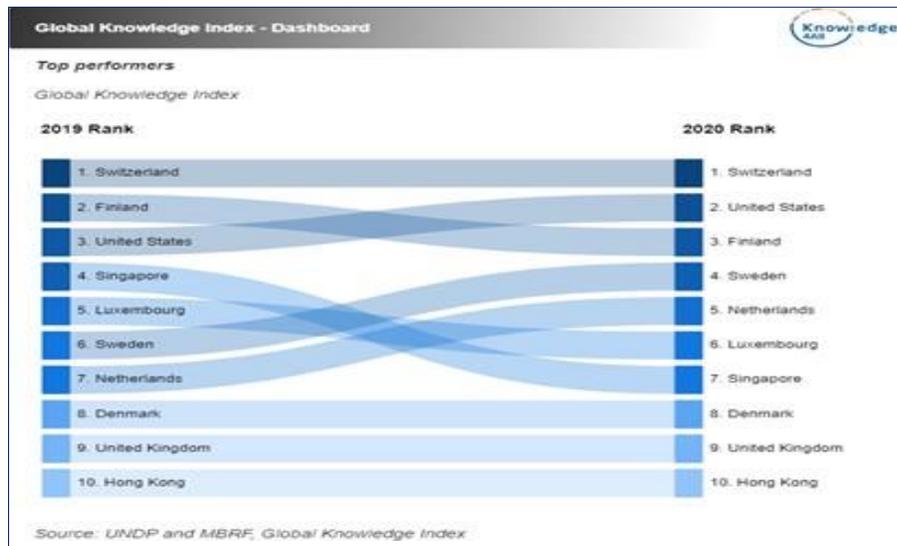
b) *Top Improvers*: Fig. 3 shows the top improving countries per indicator. Only positive changes are visualized by comparing ranks of 2019 and 2020. A ‘country performance summary’ section has been added in GKI 2020 wherein it describes the country performance as leading, strong, moderate, modest or weak according to its GKI score and rank. In the fig.3, Egypt stands as the top improving country in 2020. However, Egypt is a moderate performer in terms of its knowledge infrastructure. It ranked 72<sup>nd</sup> out of 138 countries. On the other hand, China is a strong performer in terms of its knowledge infrastructure and secured 31<sup>st</sup> rank among 138 countries.

The figure is a dashboard titled 'Global Knowledge Index - Dashboard' with a 'Knowledge 4all' logo. It features a table under the heading 'Top Improvers' with the sub-heading 'Global Knowledge Index'. The table lists the top six improving countries based on their rank change from 2019 to 2020. Each row includes a small flag icon, the country name, the 2019 rank, the 2020 rank, and the change in rank. The source is cited as 'UNDP and MBRF, Global Knowledge Index'.

Country	2019 Rank	2020 Rank	Change
Egypt	82	72	+10
Saudi Arabia	52	42	+10
Morocco	92	83	+9
Iran	88	80	+8
Cambodia	97	90	+7
China	38	31	+7

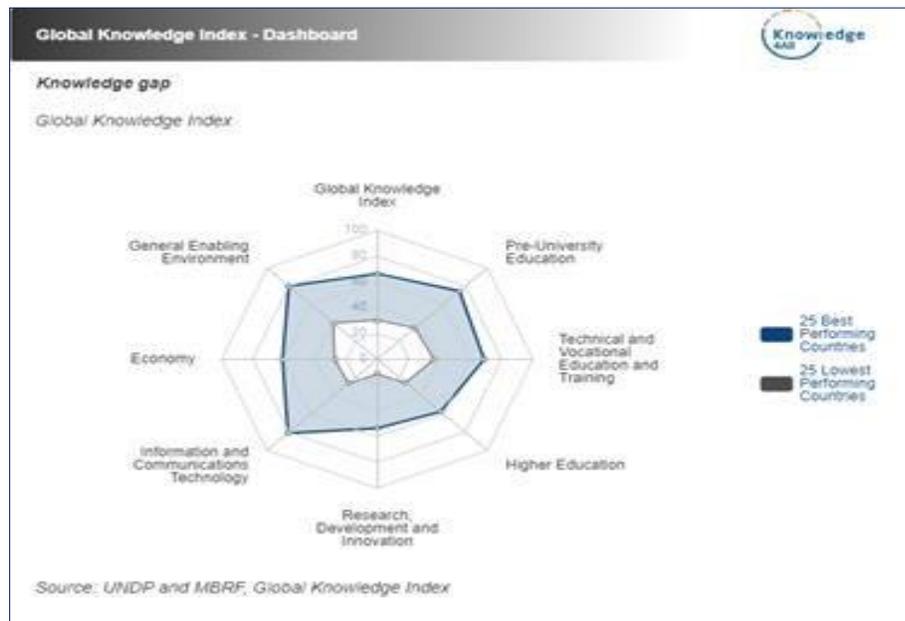
**Figure 3.** Top Improvers

c) *Top Performers*: Fig. 4 shows that Switzerland is a leading performer in terms of its knowledge infrastructure by securing top position among 138 countries in GKI 2020.



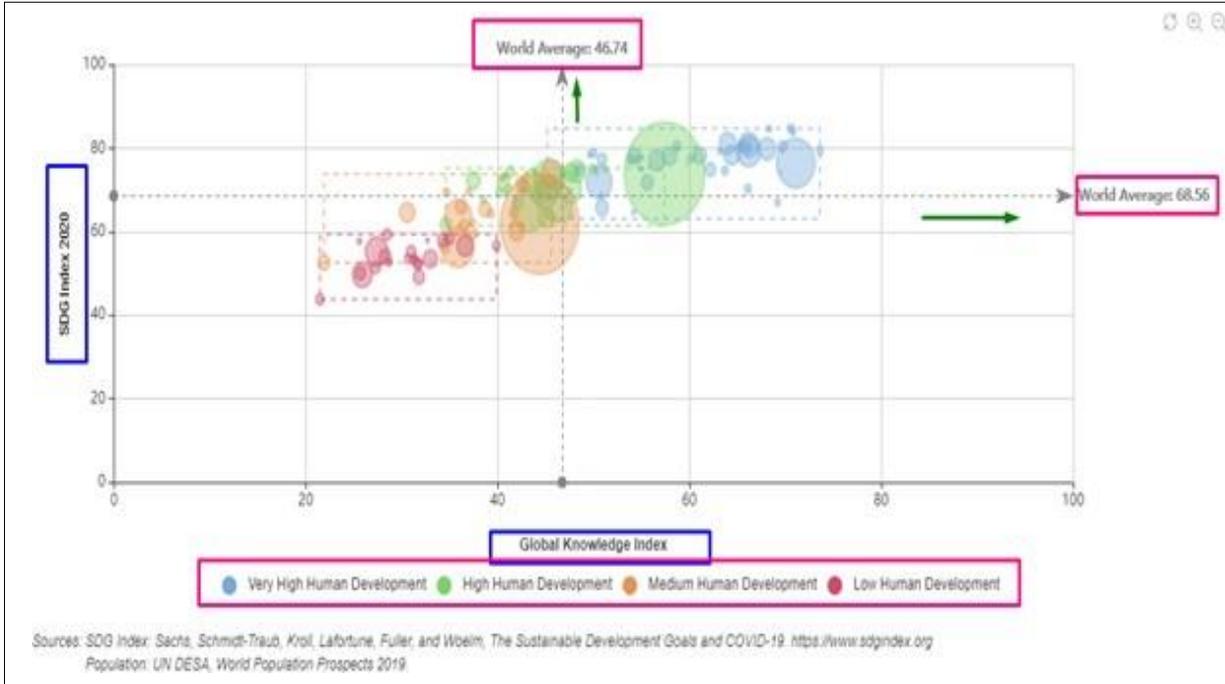
**Figure 4. Top Performers**

d) *Knowledge Gap*: In fig. 5, the knowledge gap is visualized as the difference between the average of the 25 best-performing countries and that of the 25 lowest-performing countries.



**Figure 5. Knowledge Gap**

e) *GKI and SDG Index*: The Sustainable Development Goals (SDG) Index tracks performance of countries on the basis of 17 SDGs. According to SDG 2020 index, Sweden secured SDG global rank 1<sup>st</sup> among 166 countries with 84.7 score ([https://s3.amazonaws.com/sustainabledevelopment.report/2020/2020\\_sustainable\\_development\\_report.pdf](https://s3.amazonaws.com/sustainabledevelopment.report/2020/2020_sustainable_development_report.pdf)). In fig.6, The GKI on the x-axis shows a world average of 46.74 score whereas SDG index on y-axis shows world average of 68.56 score.



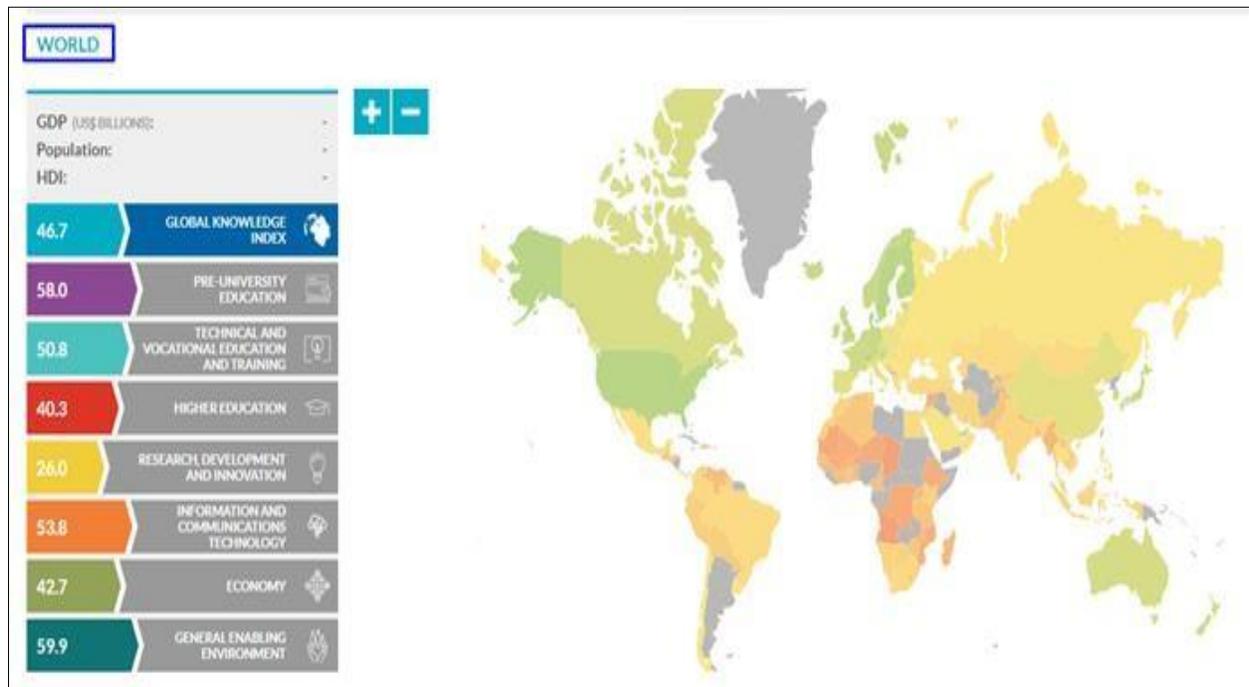
**Figure 6.** GKI and SDG Index

f) *Global Ranking:* Fig. 7 shows top 10 countries in which Switzerland secured 1<sup>st</sup> rank among 138 countries and is a leading performer in terms of its knowledge infrastructure with a 73.6 GKI score. However, Hong Kong, China (SAR) secured 10<sup>th</sup> rank out of 138 countries.

GLOBAL KNOWLEDGE INDEX		Value
World average		46.7
1	Switzerland	73.6
2	United States	71.1
3	Finland	70.6
4	Sweden	70.6
5	Netherlands	69.7
6	Luxembourg	69.5
7	Singapore	69.2
8	Denmark	68.3
9	United Kingdom	68.1
10	Hong Kong, China (SAR)	66.8

**Figure 7.** Global Ranking

g) *Heat Map:* In fig. 8, the heat map shows world average of 46.7 GKI score. However average of the other knowledge dimensions of GKI depicts scores as General Enabling Environment (59.9), Pre-University education (58.0), Information and communications technology (53.8), Technical and vocational education and training (50.8), Economy (42.7), Higher education (40.3) and Research, development and innovation (26.0).



**Figure 8.** Heat Map

### Literature Review

After a thorough literature search, the authors discovered a paucity of pre-existing literature predominantly on "Scientometric analysis of Knowledge Society literature". Hence, the present study will add to the existing body of knowledge in the field of "Scientometric" generally and analysis of research output of "Knowledge Society" literature specifically.

### Scientometrics

The definition of Scientometrics was first proposed by Mulchenko as "a quantitative study of the research on the development of science"(Mulchenko , 1969). It can be considered as a technique that includes measuring research impact, understanding the citation process, mapping the knowledge structure and evolution in a domain based on the large-scale scholarly dataset (Borner *et.al.*, 2003). Through processing enormous bibliometric data, scientometric methods help researchers find systematic literature-related discoveries by linking literature concepts that may be overlooked in manual review studies (Su and Lee, 2010).

### Research Questions

The study was intended to answer the following research questions:

- RQ1.* What is the global trend of scientific publications and citations on KS research?
- RQ2.* Who are the most active or influential authors, countries and sources publishing on KS research?
- RQ3.* Who are the most collaborative authors, countries and cited documents publishing on KS research?
- RQ4.* Which are the dominant key research topics and streams?

### Research Design

The literature published on KS were gleaned from the Scopus database which is a comprehensive citation database with influential and multidisciplinary documents. The following search string was used to retrieve the data: (TITLE-ABS-KEY ("Knowledge Society")). The time span of publications taken was 1970 to 2021 and a total of 3108 documents were retrieved. Scopus database facilitates data in different data formats. For this

analysis, the basic data processing work was carried out using the CSV file formats and tables. Graphs were generated out of the processed data using Microsoft Excel. For developing the network visualization maps from the data, two freely available softwares, VOSviewer (VV) and Biblioshiny - a web-interface for bibliometrix were used. The gathered data from database was imported into VOSviewer and Biblioshiny. All type of publications were included for the study of KS literature; Articles, book reviews, editorials, conference papers etc. There was no limitation on document language. The study also undertakes the Conceptual structure analysis of KS literature, Factorial analysis of keywords plus and Topic dendrogram analysis.

## Results and Discussion

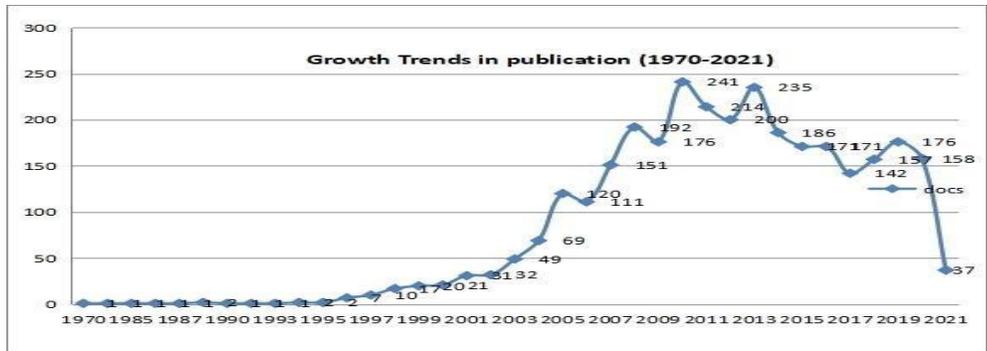
### (1) Trends in Publications and Citations

Table I. provides the descriptive information on KS literature. The following table shows that 3108 documents are written by a total of 5336 authors. Among them, 1185 articles are single authored. There is a high collaboration in KS publications that is shown by the collaboration index. Document per author ratio is 0.582, which means on an average, almost 2 authors have written one document.

**Table I.** Trends in Publications and Citations

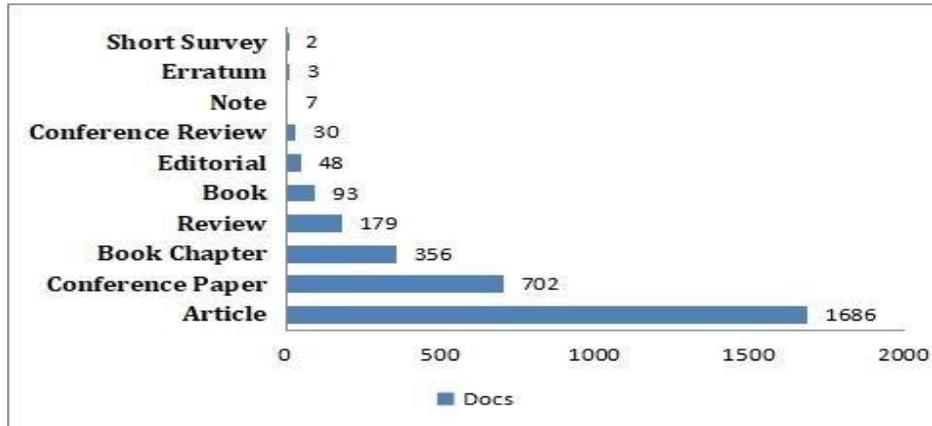
Description	Results
<b><i>Publications</i></b>	
Time Span	1970-2021
Sources (Journals, Books, etc.)	1700
Documents	3108
Average citations per year per doc	0.8256
Keywords Plus (ID)	5122
<b><i>Authors</i></b>	
Total Authors	5336
Author Appearances	6430
Authors of single-authored documents	1185
Authors of multi-authored documents	4151
<b><i>Authors Collaborations</i></b>	
Single-authored documents	1416
Documents per Author	0.582
Authors per Document	1.72
Co-Authors per Documents	2.07
Collaboration Index	2.45

Fig. 9 shows the annual growth trends in KS Publications from 1970-2021 representing an ascending pattern four times. The ascending pattern occurred in 2004-2005, 2006-2007, 2007-2008, 2009-2010 and 2012-2013. After 2013, there is a descending pattern in the KS research. Thus, since 2013, the KS research area is not gaining attention from the researchers and has not reached a high level, suggesting that this research lacks attention and significant breakthroughs in recent years.



**Figure 9.** Annual growth trends in KS publications (1970-2021)

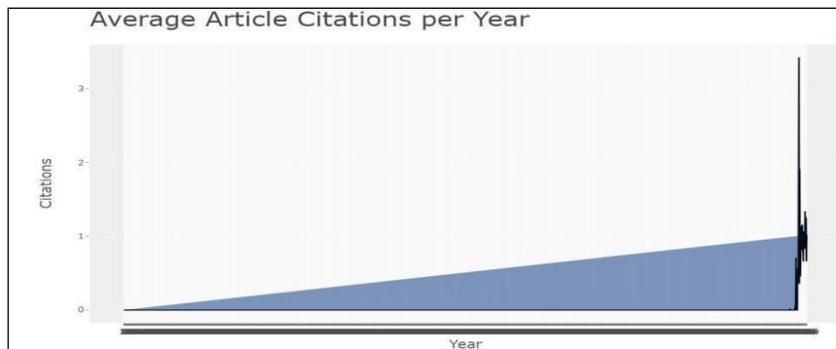
Figure 10. shows total number of 3108 publications (TP), retrieved from the Scopus database and divided into 10 document types for the period 1970 to 2021. Journal articles (n=1686, 54.2%) ranked first followed by conference papers (n=702, 22.6%), book chapter (n=356, 11.5%) and Reviews (n=179; 5.8%).



**Figure 10.** Publications according to type of documents

*(1.1) Trends in Citations*

Fig. 11 shows the citation per year for KS publications. There is a significant increase in the annual citation of KS publications from 1970-2021.



**Figure 11.** Average citation per year of KS publications

*(2) Influential Authors, Countries and Sources*

The data from table 2 shows the top 10 prolific authors. In the entire dataset of 5336 authors, 1185 authors (22.2%) published a single paper related to KS research and are considered “occasional” authors. Authors who published more than one paper are considered to be “core” authors and 4151 (77.8%) authors published multiple papers. Garcia-Penalvo, F.J. (University of Salamanca, Spain) ranked 1<sup>st</sup> in the number of published articles (n = 22), Stehr, N. (Zeppelin University, Germany) ranked 2<sup>nd</sup> (n=18), Moreno-Jimenez, J.M. (University of Zaragoza,Spain) ranked 3<sup>rd</sup> (n=16), Karpov, A.O. (Bauman Moscow State Technical University,Russia) and Schmitt, U (Stellenbosch University, S.Africa) ranked 4<sup>th</sup> and 5<sup>th</sup> (n=15) respectively.Authors with highest h-index are Garcia-Penalvo, F.J. (University of Salamanca,Spain) (h-index=37), and Moreno-Jimenez, J.M. (University of Zaragoza,Spain) (h-index=21).

**Table II.** Top 10 Prolific Authors

SN	Author	Country	Affiliation	Number of Publications (n)	Total Citations (TC)	Average citation per pub. (CPP)	h-index
1	Garcia-Penalvo, F.J.	Spain	University of Salamanca	22	297	12.68	37
2	Stehr, N.	Germany	Zeppelin University	18	90	5	15
3	Moreno-Jimenez, J.M.	Spain	University in Zaragoza	16	116	7.25	21
4	Karpov, A.O.	Russia	Bauman Moscow State Technical University	15	72	4.8	5
5	Schmitt, U.	South Africa	Stellenbosch University	15	133	8.8	9
6	Stock, W.G.	Germany	Heinrich Heine University Dusseldorf	14	190	13.57	19
7	Mainka, A.	Germany	Heinrich Heine University Dusseldorf	11	130	11.81	9
8	Evers, H.D.	Germany	University of Bonn Center for Development Research	9	144	16	14
9	Lytras, M.D.	Saudi Arabia	King Abdulaziz University	9	190	21.1	30
10	Michelini, R.C.	Italy	University Of Genoa	9	36	4	13

*(2.1) Active Countries*

181 countries are contributing in KS research. Among them, 1690 (54.37%) of publications are contributed by the top ten most productive countries (Table III). Spain ranked 1<sup>st</sup> by publishing the maximum papers (n = 358) followed by other prolific countries like Germany (n = 281), United states (n = 236), United Kingdom (n = 188), Italy (n=161) and so on.

**Table III.** Top 10 Active Countries

SN	Country	Number of Publications (n)	Total Citations (TC)	Avg. citation (AC)
1	Spain	358	2783	7.8
2	Germany	281	3480	12.4
3	United States	236	4338	18.38
4	United Kingdom	188	4281	22.8
5	Italy	161	900	5.6
6	India	100	725	7.25
7	Australia	97	1328	13.7
8	Romania	95	143	1.50
9	France	87	856	9.9
10	Netherlands	87	2149	24.8

*(2.3) Core Sources*

There are 1700 sources, publishing related to KS research. According to table 4, Communications in Computer and Information Science Book series has the highest publication output (n=66) followed by ACM International Conference Proceeding Series (n=59), Lecture Notes in Computer Science including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics (n=48).

The most cited sources are Computers in Human Behavior (n=342), ACM International Conference Proceeding Series (n=233), Rusc Universities and Knowledge Society Journal (n=166). Lecture Notes in Computer Science (n=400) followed by Computers In Human Behavior (n=178) and ACM International Conference Proceeding Series (n=123) has the highest h index.

**Table IV.** Top 10 Core Sources

SN	Sources	No. of Publications (n)	Total Citations (TC)	Avg. citation	h-index	Subject category
1	Communications in computer and information science	66	151	2.2	51	Mathematics; Computer Science
2	ACM International Conference Proceeding Series	59	233	3.949	123	Computer Science
3	Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics	48	123	2.562	400	Computer Science; Mathematics

4	IFIP Advances In Information Communication Technology And	28	69	2.46	53	Decision Sciences; Computer Science
5	Proceedings of the European conference on knowledge management, eckm	27	16	0.59	10	Decision Sciences
6	Advances In Intelligent Systems And Computing	21	31	1.47	41	Engineering and Computer Science
7	Journal Of Dharma	19	2	0.105	3	Arts and Humanities
8	Voprosy Filosofii	17	20	1.176	8	Arts and Humanities
9	Computers In Human Behavior	15	342	22.8	178	Arts and Humanities; Psychology; Computer Science
10	Rusc Universities And Knowledge Society Journal	14	166	11.85	12	Social Sciences and Education

(3) Visualization Analyses of Co-Authorships, Country Collaboration and Cited Documents

VV Software has been used to analyse the co-authorship analysis of the authors. From a total of 5336 authors 190 meet the threshold by taking the author having atleast 3 documents. Out of 190, only 13 authors represent the connections to each other. As shown in fig. 12, the network contains 13 nodes, 15 co-authorship links and 5 clusters. Each node in the figure represents an author's productivity and the links between the authors denote the collaboration established through the co-authorship in the articles. The total link strength is 32. The number of publications which two researchers have co-authored is known as the link strength. All authors are divided into 5 clusters. The colour of the circles remains the same for the authors in the same cluster. Cluster 1 (Red) includes 3 authors De Pablos, P.O., Lytras, M. and Lytras M.D., Cluster 2 (Green) has 3 authors; Garcia-Holgado A., Garcia-Penalvo F.J. and Ramirez-Montoya M.S., Cluster 3 (Blue) includes 3 authors; Chatti, M.A., Naeve, A. and Scott, P., Cluster 4 (Yellow) has 2 authors; Casillas-Martin S. and Cabezas-Gonzalez, Cluster 5 (Purple) has 2 authors; Braz M.H.L.B and Siqueira S.W.M.

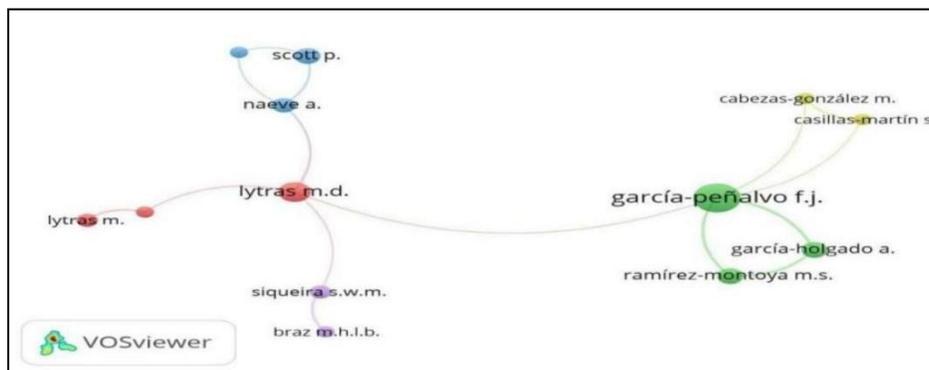
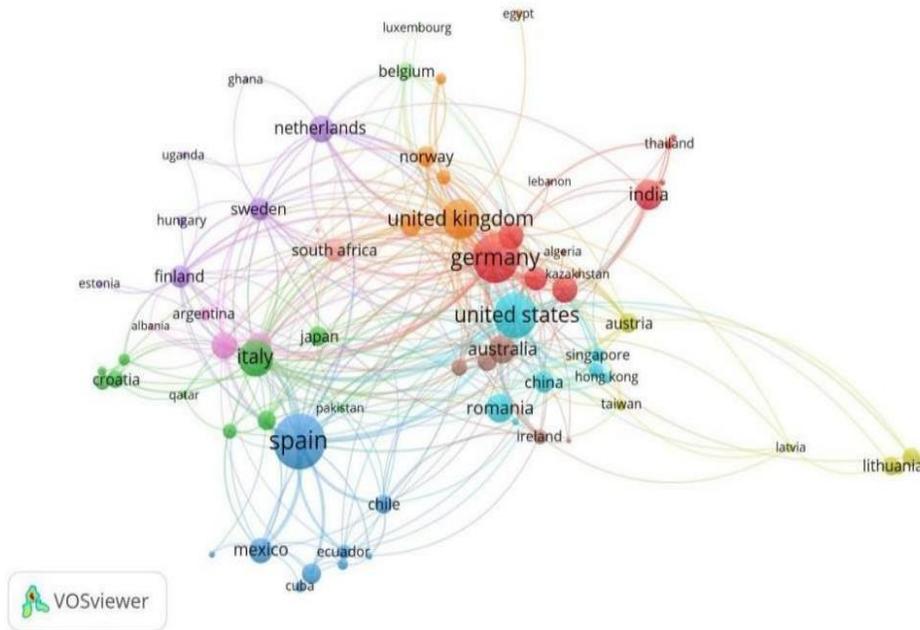


Figure 12. Network Visualization of Co-authorship analysis

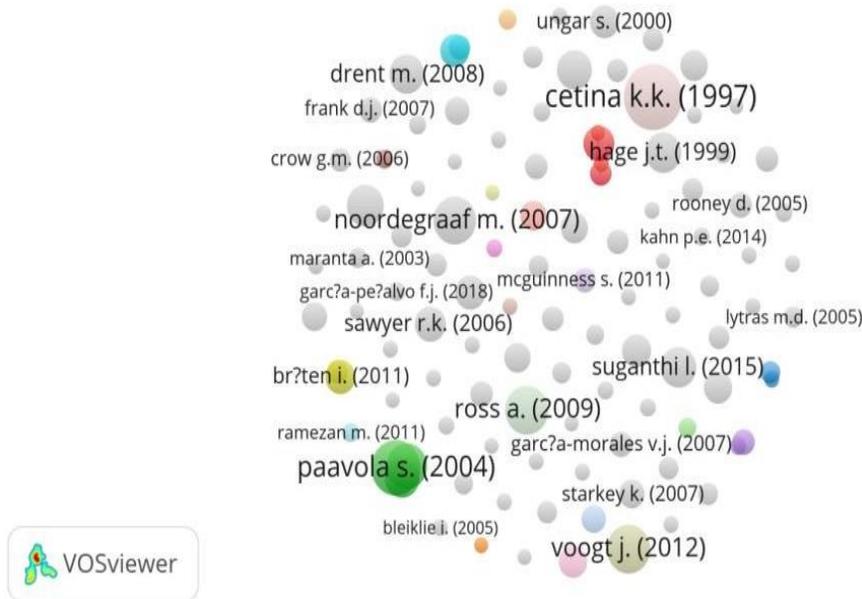
### (3.1) Country collaboration analysis

The top country collaboration map on KS research is shown in fig. 13. USA has highest collaboration (n=41 links) with other countries viz. Germany, UK, Spain, Italy, France, China. UK is the 2<sup>nd</sup> most collaborative country with 35 links and showing links with US, Germany, Netherlands, Italy, Australia. Germany is the 3<sup>rd</sup> most collaborative country with 30 links and has links with Portugal, Netherlands, Finland, Australia. The least collaborator countries with 2 or 3 links are Egypt, Ghana, Estonia, Hungary and Luxembourg.



**Figure 13.** Country collaboration Map by VV

### (3.2) Citation analysis of documents



**Figure 14.** Authors of most cited documents on KS

Fig. 14 and Table 5 shows authors of most cited documents and list of top 10 highly cited papers respectively. All of these 10 papers have more than 100 citations. Only one publication lies in the category of papers with more than 500 citations i.e., “Sociality with Objects: Social Relations in Post Social Knowledge Societies”, authored by K. K. Cetina , published in Theory, Culture & Society (1997), obtained a total citation count of 600. The second most cited paper, “Models of Innovative Knowledge Communities and Three Metaphors of Learning”, authored by S.Paavola , L. and Lipponen, K. Hakkarainen and published in Review of Educational Research (2004).

**Table V.** Top 10 most cited documents

SN	Title	Author	Source	Total Citations (TC)	Avg. Pub Year (APY)
1	Sociality with Objects: Social Relations in Post social Knowledge Societies	Karin Knorr Cetina	Theory, Culture & Society	600	1997
2	Models of Innovative Knowledge Communities and Three Metaphors of Learning	Sami Paavola , L. and Lipponen,Kai Hakkarainen	Review of Educational Research	449	2004
3	Nice Work if you can get it: Life and labour in precarious times	Ross, A.	NYU Series in Social and Cultural Analysis	364	2009
4	A comparative analysis of international frameworks for 21st century competencies: Implications for national curriculum policies	Joke Voogt and Natalie Pareja Roblin	Journal of Curriculum Studies	353	2012
5	From “Pure” to “Hybrid” Professionalism: Present-Day Professionalism in Ambiguous Public Domains	Mirko Noordegraaf	Administration & Society	350	2007
6	The Knowledge Creation Metaphor – An Emergent Epistemological Approach to Learning	Sami Paavola and Kai Hakkarainen	Science & Education	316	2005
7	The Emergence of Transdisciplinarity as a Form of Research	Gertrude Hirsch Hadorn and others	Handbook of Transdisciplinary Research	274	2008
8	Applications of fuzzy logic in renewable energy systems – A review	L.Suganthia, S.Iniyan and Anand A.Samuel	Renewable and Sustainable Energy Reviews	255	2015
9	Organizational Innovation and organizational change	J. T. Hage	Annual Review of Sociology	253	1999



(4.2.2) Factorial analysis of keywords plus

The factorial analysis map of Keywords Plus as shown in fig. 17 is helpful in identifying subfields in KS literature. FA is used to reduce the dimensionality of data and data is represented in low dimensionality space. Various dimensionality reduction techniques can be applied. Multi-Correspondence Analysis (MCA) technique as by default by R shiny has been applied.

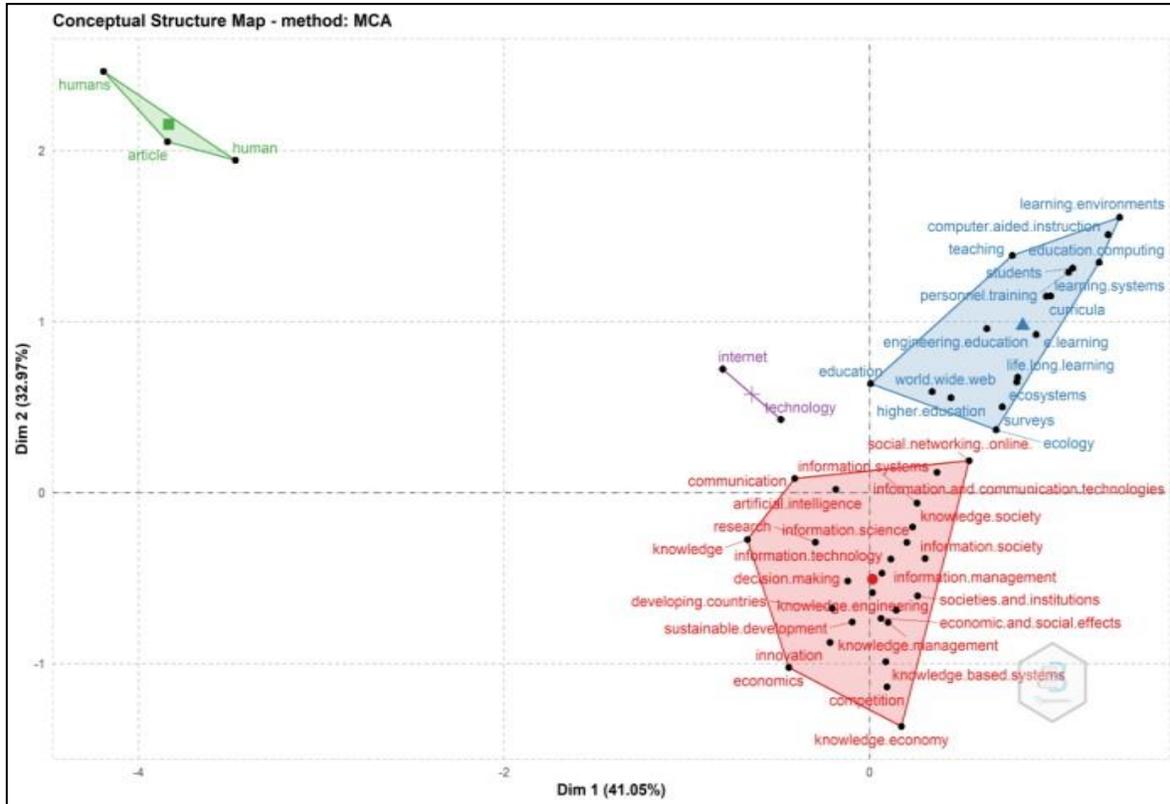
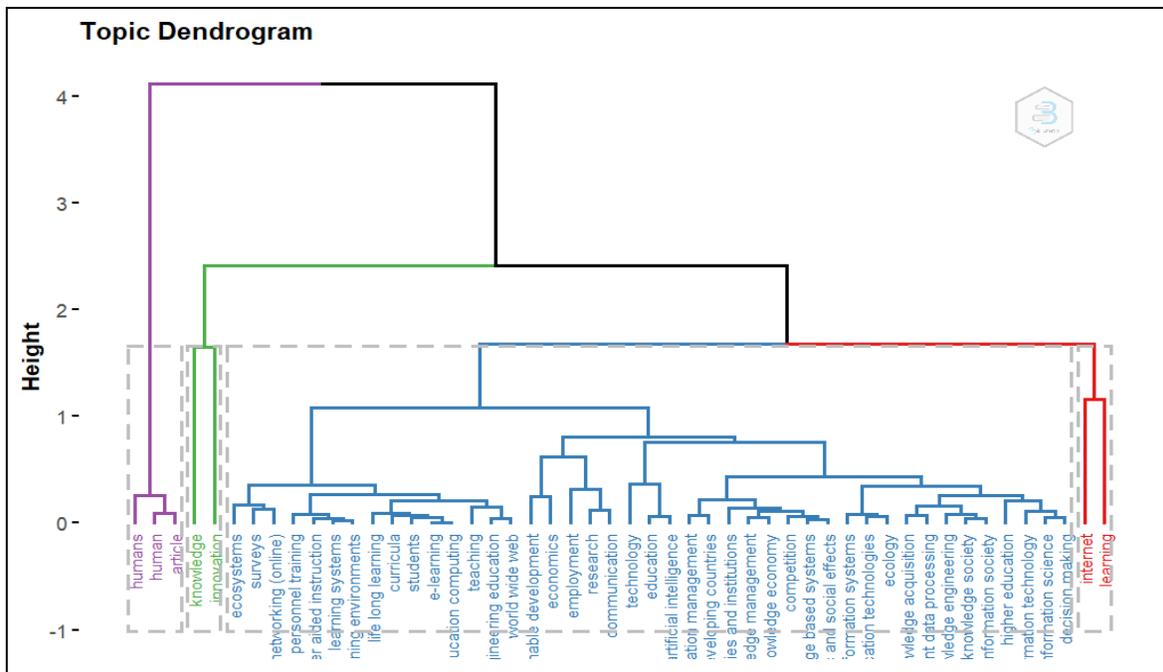


Figure 17: Factorial Analysis of Keywords Plus

(4.2.3) Topic dendrogram analysis

In fig. 18, dendrogram is divided into 4 sections. Each section includes keywords which represents similar concepts and topic. Purple section includes topics as humans, human, and article. Green section includes topics as Knowledge, Innovation related keywords. Blue section includes keywords like networking, personal training, learning systems, lifelong learning, learning, students, education. Red section includes internet learning related topics or articles. From the figure, it is observed that all these topics or research areas are key factors in the development of knowledge society as implication of technology, ICT in KS, networks in KS which depicts networked society reinforce intelligence and innovation in Knowledge society.



**Figure 18:** Topic Dendrogram analysis

*(4.2.4) Co-occurrence of all the keywords on KS*

The network visualization of the “Knowledge society” literature is shown in fig. 19. Each circle or node represents the keywords and the circle sizes indicates the number of occurrences of keywords appeared in the literature. Taking the various dimensions of “Knowledge society” as analysis, five larger groups are identified and divided into 5 clusters with different colours assigned to the nodes viz. Red, green, blue, yellow and purple. The links connecting two circles stands for the multidimensional nature of the field. The cluster analysis results are being discussed below:

Cluster	Colour	Discussion
<i>Cluster 1</i>		with keywords Knowledge Society, knowledge, education or higher education, etc. has the highest visibility in the network representing that the knowledge or education especially higher education is facilitating economic growth and societal change thus contributing to building knowledge societies.
<i>Cluster 2</i>		with keywords E-learning, teaching, students, learning systems, etc. represent that E-learning stimulates lifelong learning and fostering possible scenarios of a knowledge society through advances in instructional tools for teaching and other digital technologies.
<i>Cluster 3</i>		with keywords Knowledge management, knowledge-based systems, knowledge economy, etc. represent that Knowledge management and its related aspects are playing a key role in the enhancement of knowledge societies. Knowledge management system creates, captures, and shares both explicit and tacit knowledge in the most efficient and reliable manner and hence contributes to knowledge sharing.
<i>Cluster 4</i>		with keywords Sustainable development, skill, planning etc. represent that sustainable development of society ensures proper planning and skills for production and diffusion of educational, scientific, cultural materials and preservation of the digital heritage. Libraries and other Information organizations can play a significant role in this.



N. and Moreno-Jimenez, J.M. The most prolific countries are Spain, Germany, United States, United Kingdom and Italy. Communications in Computer and Information Science Book Series has the highest publication output, followed by ACM International Conference Proceeding Series, Lecture Notes in Computer Science including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics.

Knowledge Society emerged as a new civilization resulting into modern societal change fueled by technological innovation, institutional transformation, human development and its engagement in knowledge creation. Hence, this study is a comprehensive view of the whole area of KS covering all of the aspects that comprise this research topic. KS as a field attained a significant development particularly during the last 51 years and has multifarious applications in different domains of study.

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