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Bibliometric Analysis of Digital Literacy Research Output: A Global Perspective

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A Global Perspective

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Abstract

The study aimed to assess theDigital Literacy research output during the period of 1992-2011.The web of science database has used to retrieve records related to digital literacy research.The bibliographic citation retrieved data are analyzed using theHistcite Software application. Based on the retrieved data, digital literacy research publication is analyzed and interpreted. The performance of the most productivity countries, authors, journals,language-wise, Institution –wise, keyword wise and citation reference is analyzed.Relative Growth rate and doubling time have assessed. The performance of the most productivity countries and the highest number of articles are published in the form of total articles that covers 512 records. The maximum number of papers 126 is published in the year 2011. Journal of Adolescent & Adult Literacy journal placed in the first position with 18 records.

Keywords: Bibliometrics, Digital Literacy, Authorship Pattern, Degree of Collaboration, Research Productivity, Web of Science.

1. Introduction

Bibliometrics is that part of information theory that analyze quantitatively the properties and behavior of recorded knowledge. Through this technique, we can study only the recorded, not the knowledge itself.Similar to other science subjects, the discipline of library and information science does not merely rely only on assumptions and opinion derived out of thinking and experience. It is looking forward to research based on quantitative measurement and objective analysis of data. Among several other such kinds of analytical scientific developments, one that has been inviting lot of attention and research activities is the field of 'bibliometrics'.

It is important to put the concept of digital literacy in a historical context. It starts with the term literacy which 3000 years ago meant being an effective public speaker; being able to use theoretical tools of persuasion. So literacy in its fundamental sense is the sharing of meaning through language. With Guttenberg, literacy was redefined to include reading and writing. The portable camera brought about the ease of producing and distributing images - so educators introduced the concept of visual literacy, highlighting the importance of how to look at images, and understand the way images communicate and carry meaning. The emergence of databases introduced a new wave of powerful technologies to shape literacy. These technologies needed a new set of skills, competences and strategies for searching, finding and evaluating information - creating information literacy.

Similarly the Royal Society for DL in the "Shut down or restart" report which came out in January 2012 states:

Digital literacy should be understood to mean the basic skill or ability to use a computer confidently, safely and effectively, including: the ability to use office software such as word processors, email and presentation software, the ability to create and edit images, audio and video, and the ability to use a web browser and Internet search engines. These are the skills that teachers of other subjects at secondary school should be able to assume that their pupils have, as an analogue of being able to read and write." (Royal Society, 2012).

2.Review of Literature

Amsaveni and Kalisdha(2012) examined Indian contribution in Swine Flu. The global contribution was 1388 and Indian productivity is only 267 papers in this regard distributed by researchers in the field of Swine Flu covered in Science Citation index database were received and published from 1971 to 2010 by the researchers. Thanuskodi(2011)analyzed a bibliometric study of Journal Library herald research for the period of 2006 to 2010. The results found that the highest of the contribution was from India 89.85% and the rest 10.15% only from foreign sources. Sivakami and Baskaran (2014) studied a scientometricanalysis ofWine Flu research productivity 50627 papersduring the2001to 2012 using PubMed database whichincreases paper 5712 paper in 2009 to 5615 in 2012. The study concludes that the highest productivity in the year 2010 & 2011.The degree of collaboration 0.884 represents 88 % published during the period.

Zhong Li., et al (2017)analyzed 6127 Papers on evolution and future trends of integrated health care during the period of 1997 to 2016 from using Web of Science database. The USA, UK, Canada are leadingdeveloped Health Care research with the highest publication, Citation and productivity Institutions.Shahram (2013)examined the study of Behcet's disease during the period of 1990 to 2010 by data retrieving from ISI Web of Science. The specific features such as publication year, the language of articles, geographical distribution, and main journals in the field. The study concludes considerable growth in scientific production and citation to BD articles in the last two decades.

3. Objectives of the study

The main objective of the study to identify the source–wise distribution of digital literacy research output of the study from 1992-2011.

- To analyzes the Authorship Pattern of Publication in digital literacy.
- To examine Degree of collaboration research productivity
- To study relative growth rate and doubling time in the field of digital literacy.
- To identify the document wise distribution of publications.
- To assess the Institution wise research publication
- To examine the keyword wise distribution of publications.
- To identify the Journal wise distribution of digital literacy.
- To find out the country-wise distribution on publication around the world

4.Scope and Limitation of the Study

The scope of the present study is limited to the journals accessible in the Web of Science database. The Keyword used for the study is Global Research Output in 'Digital Literacy': A Bibliometric analysis of Publication Output during 1992-2011.

5. Methodology

In this study attempted to analyze the research output in the field of 'digital literacy' during the period of 1992-2011. The retrieved bibliographic and citation data collected from Web of science database. Web of science/knowledgeis produced Thomson Reuter's multidisciplinary database of bibliographic information such as the Science Citation Index, now

maintained by Clarivate Analytics. A total of 512 records were downloaded and usingthe Histcite Software application the downloaded data are classified as per the objectives of the study. The study examines the author's productivity and degree of collaboration in digital literacy research output.

6.Data Analysis and Interpretation

Table 1-Year-wise distribution of Articles

Sl.No	Year	Records	LCS	GCS
1	1992	1	0	0
2	1993	4	0	47
3	1994	1	0	18
4	1995	1	0	19
5	1996	1	0	12
6	1997	7	6	56
7	1998	2	1	1
8	1999	7	0	5
9	2000	3	0	19
10	2001	8	20	453
11	2002	8	6	234
12	2003	21	21	827
13	2004	15	15	306
14	2005	23	32	622
15	2006	28	9	610
16	2007	27	20	1063
17	2008	69	22	1409
18	2009	69	34	1715
19	2010	91	16	2074
20	2011	126	1	2170

Table 1 shows the article "Digital Literacy" published (512) articles from the period of 1992 to 2011. It is observed that the majority of the articles (126) were published in the year 2011. It is found that very less number of articles (1) was published in the year of 1992,1994,1995,1996. Fig.1 clearly shows that there is the main growth of articles up until the year 2011 in the journal "Digital Literacy".
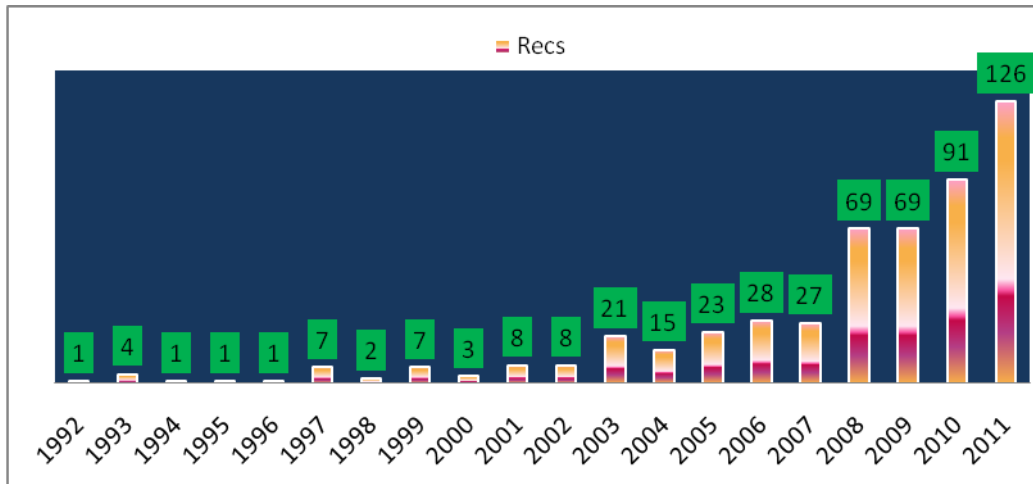
Fig .1 Year Wise Distribution

Year –wise distribution number of articles published in the field of Digital literacy from 1992 to 2011

6.2 Relative Growth Rate (RGR) and Doubling Time (DT) of year- wise Publication

       The relative growth rate of publications was analyzed through well-known techniques. The mean relative growth rate R (1-2) over a specified period of the interval can be calculated from the following equation suggested by Mahapatra:

$$\text{RGR}= \frac{W2-W1}{T2-T1}$$

W1= Log w1 (Natural log of the initial number of Publications/Pages);

W2= Log w1 (Natural log of the initial number of Publications/Pages);

T2-T1= Unit difference between the initial time and final time. Therefore,

R (a) = Relative growth Rate per unit of publications per of time(year)

R (p) = Relative growth Rate per unit of publications per of time(year)

Dt= 0.693/R (a)

Table2- Relative Growth Rate and Doubling Time of Year-wise Publications

Sl.No	Year	Output	Cumulative	W1	W2	RGR	Dt
1	1992	1	1	0	0	0	-
2	1993	4	5	0	1.60	1.60	0.43
3	1994	1	6	1.60	1.79	0.18	3.80
4	1995	1	7	1.79	1.94	0.15	4.49
5	1996	1	8	1.94	2.07	0.13	5.18
6	1997	7	15	2.07	2.70	0.62	1.10
7	1998	2	17	2.70	2.83	0.12	5.53
8	1999	7	24	2.83	3.17	0.34	2.00
9	2000	3	27	3.17	3.29	0.11	5.88
10	2001	8	35	3.29	3.55	0.25	2.67
11	2002	8	43	3.55	3.76	0.20	3.36
12	2003	21	64	3.76	4.15	0.39	1.74
13	2004	15	79	4.15	4.36	0.21	3.29
14	2005	23	102	4.36	4.62	0.25	2.71
15	2006	28	130	4.62	4.86	0.24	2.85
16	2007	27	157	4.86	5.05	0.18	3.67
17	2008	69	226	5.05	5.42	0.36	1.90
18	2009	69	295	5.42	5.68	0.26	2.60
19	2010	91	386	5.68	5.95	0.26	2.57
20	2011	126	512	5.95	6.23	0.28	2.45
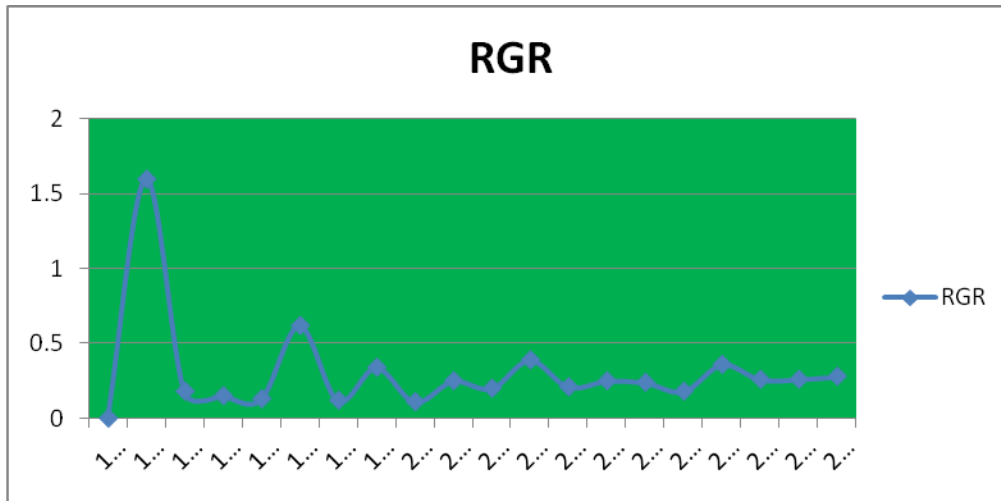
Fig 2: Relative Growth Rate
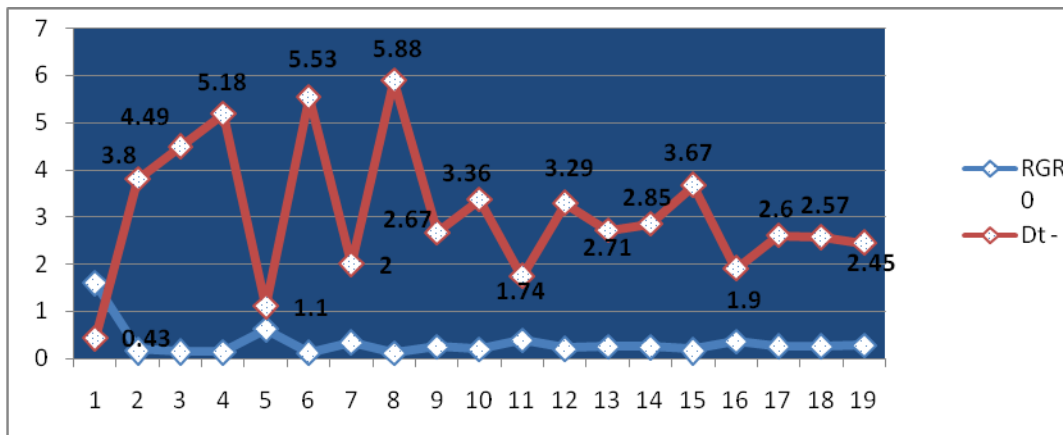
Fig 3: RGR and doubling time of Digital Literacy

The analysis of relative growth rate and doubling time of publications were discussed and present study. The study on Digital literacy research output aims to identify the trends and growth of prospects in the present study. The growth rate is the increase in the number of publications/pages per unit of time.The average number of publications which decreased from is the rate of 0.18 in 1994 and 2011 atthe rate of 0.28.At the same time, the values of doubling time (DT) of publications increased from 0.43 in 1993 to 2.45 in the last year 2011.

Table 3-Author wise distribution of the publication

Sl.No	Author	Records	LCS	GCS

1	Hargittai E	7	36	1055
2	Livingstone S	5	17	812
3	Bawden D	4	21	482
4	Honan E	4	3	28
5	Miller EA	4	8	104
6	Nicholas D	4	3	227
7	van Deursen AJAM	4	0	381
8	van Dijk JAGM	4	0	381
9	West DM	4	8	104
10	Williams P	4	3	227
11	Burnett C	3	2	38
12	Chauvin P	3	2	100
13	Kalichman SC	3	3	161
14	Marzal MA	3	1	18
15	Merchant G	3	1	86
16	Mills KA	3	4	152
17	Renahy E	3	2	100
18	Robinson L	3	4	235
19	Rothman RL	3	0	246
20	Rowley J	3	2	88

Table 3 reveals that the author wise distribution of articles published and citations are available in the Web of Science. We consider in the top twenty authors only. Among 20, Hargittai E maximum number of contributed 7 articles with local citation 36 and global citation 1055 followed by author Livingstone S in the second position with 5 articles local citation 17 and

global citation 812, Bawden D, Honan E, Miller EA, Nicholas D, van Deursen AJAM, van Dijk JAGM, West DM, Williams P in the author third position their articles with 4,least of distributed article another authors.

Table 4-Authorship Pattern of Digital Literacy Output

Sl.No	No .of Author	No. of Articles	% Articles	Total No of Authors	%Author
1	Single Author	228	44.53	228	19.38
2	Two Author	142	27.73	284	24.14
3	Three Author	55	10.74	165	14.03
4	Four Author	38	7.42	152	12.92
5	Five Author	16	3.125	80	6.80
6	Six Author	14	2.73	84	7.14
7	Seven Author	3	0.58	21	1.78
8	More than Eight Author	16	3.12	162	13.77
	Total	**512**	**100.00**	**1176**	**100.00**

Table-4 described the authorship pattern that majority of articles (n=228;44.53%) were produced by single authors pattern, followed by 142 (27.73%) articles have written by double author and 55 (10.74%) articles contributed by three authors 38 (7.42%) articles contributed by four authors and Seven authors contributed 3 (0.58%) least number of articles .

Table 5- Degree of collaboration

Sl.No	Year	NS	NM	NM+NS	DC
1	1992	1	0	1	0
2	1993	3	5	8	0.62
3	1994	0	5	5	1

4	1995	1	0	1	0
5	1996	1	0	1	0
6	1997	4	8	12	0.66
7	1998	1	2	3	0.66
8	1999	6	2	8	0.25
9	2000	3	0	3	0
10	2001	3	22	25	0.88
11	2002	3	17	20	0.85
12	2003	12	31	43	0.72
13	2004	9	19	28	0.67
14	2005	10	51	61	0.83
15	2006	14	52	66	0.78
16	2007	9	59	68	0.86
17	2008	26	137	163	0.84
18	2009	34	116	150	0.77
19	2010	37	185	222	0.83
20	2011	51	237	288	0.82
Total		**228**	**948**	**1176**	**0.602(MV)**

Table 5 shows the collaborative authorship of the articles published during the period of study. The degree of collaboration in digital literacy research has been measured with the help of authorship pattern of papers. To determine the degree of collaboration in quantitative terms, the following formula given by K. Subramanyam (1983) was used for measuring collaboration. It has shown that the degree of collaboration range from zero to 0.82. The mean value found to be 0.602.

The formula is,

$$C = \frac{NM}{NM + NS}$$

C= Degree of Collaboration in a discipline or Extent of Collaboration in a discipline

NM= Number of Multiple authored Papers

NS= Number of Single authored Papers

MV= Mean Value

Table 6-Document wise distribution of Publication

Sl.No	Document Type	Records	LCS	GCS
1	Article	429	163	10391
2	Book Review	33	1	3
3	Article; Proceedings Paper	18	5	167
4	Editorial Material	17	4	212
5	Review	14	30	887
6	News Item	1	0	0

Table 6 indicated the document type distribution of articles. It shows that a maximum number of researchers are interested in publishing their documents in the form of research articles. In the present study, the highest number of citations papers 429 LCS in 163 and GCS in 10391 of the citations followed by Review 14 papers with global citation 887, Editorial Material 17 papers with 212 in global citations, Article; Proceedings Paper 18 papers 167 citations and Book Review 33 papers with citation 3 respectively.

Table 7-Language wise distribution of Publication

Sl.No	Language	Records	LCS	GCS
1	English	466	202	11465
2	Spanish	27	1	155
3	Dutch	5	0	3
4	Portuguese	4	0	7
5	French	2	0	13
6	German	2	0	2
7	Hungarian	2	0	1
8	Croatian	1	0	0

9	Czech	1	0	9
10	Slovak	1	0	0
11	Slovene	1	0	5

Table 7 shows that the majority of the papers are published in English language with 466 records LCR 202 and GCS 11465, followed by Spanish 27 articles, Dutch 5, Portuguese 4, French,German, Hungarian languages with each 2 articles, less than one article published like Croatian, Czech, Slovak, Slovene languages.

Table 8-Institution -wise distribution of Publications

Sl.No	Institution	Records	LCS	GCS
1	Unknown	27	22	277
2	Northwestern University	10	22	1091
3	Open University	9	3	241
4	Queensland University Technological	8	4	225
5	University Illinois	8	4	67
6	University Queensland	8	4	91
7	Brown University	7	8	123
8	University California Los Angeles	7	8	194
9	University Minnesota	7	12	282
10	City University London	6	21	510
11	Monash University	6	1	8
12	Sheffield Hallam University	6	3	124
13	University London School Economics & political science	6	17	830
14	University N Carolina	6	1	548

15	Columbia University	5	9	185
16	Emory University	5	0	67
17	Medical College Wisconsin	5	5	222
18	Ohio State University	5	0	50
19	University Botswana	5	1	27
20	University California Berkeley	5	9	209

The table 8 shows that the total Institution 469 (top 20) most productive world institutions associated in digital literacy research have published 747 papers during the period 1992 – 2011. The most productivity in digital literacy has contributed 27 papers published in unknown with global citation 277 followed by 10 articles with global citation 1091 in Northwestern University. The less contributed papers is by Ohio State University and Emory University 5 papers with local,citation zero global citation 50, 67.The majority of the institutions are coming from foreign institutions digital literacy research output 1992-2011.

Table 10-Country-wisedistribution of Publications

Sl.No	Country	Records	LCS	GCS
1	USA	169	82	5370
2	Unknown	80	51	1124
3	UK	64	47	2181
4	Australia	49	12	609
5	Canada	26	3	450
6	Spain	24	1	322
7	South Africa	11	2	120
8	Netherlands	10	3	574
9	Germany	8	0	146

10	Belgium	7	0	84
11	Peoples RChina	7	2	150
12	Brazil	6	0	20
13	Taiwan	6	0	72
14	Botswana	5	1	27
15	France	5	2	103
16	India	5	0	45
17	Nigeria	5	0	26
18	Norway	5	0	150
19	Israel	4	1	97
20	Italy	4	0	58

Table 10 shows the distribution of research output of different countries in the field of Digital literacy during 1992-2011. This table reveals that total 48 countries were contributed 512 articles that were published in Digital Literacy research in the worldwide. Among 48 countries USA published 169 articles and occupied first place. India places in the 16th position with 5 articles.The countries like Unknown 80 articles followed by UK (64), Australia (49), Canada (26), Spain (24), South Africa (11), Netherlands (10), and Germany (8). The lost position with 5 and 4 articles each, which shows the reason, by the lack of e-resources and application in digital literacy research.

Table 11-Journal wise distribution of Publication

Sl.No	Journal	Records	LCS	GCS
1	Journal of Adolescent & Adult Literacy	18	11	260
2	Media International Australia	15	2	23
3	Comunicar	14	0	100

4	Computers & Education	13	4	289
5	English Teaching-Practice And Critique	12	1	135
6	Electronic Library	10	1	103
7	New Media & Society	10	19	987
8	Library Trends	9	4	61
9	ASLIB Proceedings	8	3	234
10	Journal of Documentation	7	18	343
11	Information Society	6	7	115
12	Journal of Literacy Research	6	4	229
13	Journal of Research In Reading	6	6	177
14	Language and Education	6	3	93
15	Literacy	6	1	64
16	Reading Teacher	6	1	107
17	Teachers College Record	6	0	31
18	British Journal of Educational Technology	5	0	27
19	English in Australia	5	1	12
20	Journal of Computer Assisted Learning	5	0	217

Table11 has shown that majority of the contributed journals as the sources of information top 20 positions with the first position journals that published articles on Journal of Adolescent & Adult Literacy 18 records. Journal of Computer Assisted Learning was in the 20 positions with only 5 records.

Table 12-Cited reference wise Publication Top20 most cited literature

Sl.No	Author/Year/Journal	Records	Percent
1	Cazden C, 1996, Harvard Educational Review, V66, P60	31	6.1
2	Gee JP, 2003, What Video Games Have to Teach Us About Learning and Literacy, P1	30	5.9
3	Warschauer M, 2003, Technology and Social Inclusion - Rethinking the Digital DividE, P1	27	5.3
4	Kress G., 2003, Literacy New Media Age	26	5.1
5	Hargittai E, 2005, Social Science Computer Review, V23, P371, DOI 10.1177/089443930527591	19	3.7
6	Gee JP, 2004, Situated Language Learning	18	3.5
7	Kalantzis M., 2000, Multiliteracies Literacies new learning	18	3.5
8	Kress G., 2001, Multimodal Discourse	18	3.5
9	Bawden D, 2001, J DOC, V57, P218, DOI 10.1108/EUM0000000007083	17	3.3
10	Kress G., 1996, Reading Images Grammar	17	3.3
11	Lankshear C., 2006, New Literacies everyday practices and social learning	17	3.3
12	Gee J. P., 1996, Sociolinguistics Language Society and Culture	16	3.1
13	Heath S, 1983, Ways Words Language	15	2.9
14	Knobel M., 2003, New Literacies Changing Knowledge and Classroom Learning	15	2.9
15	Norris P., 2001, Digital Divide Civic	15	2.9
16	Street B., 1984, Literacy theory as Practice	15	2.9

17	Jenkins H, 2006, Convergence Culture	14	2.7
18	Hull GA, 2005, WRIT COMMUN, V22, P224, DOI 10.1177/0741088304274170	13	2.5
19	Prensky M., 2001, Horizon, V9, P1, DOI DOI 10.1108/10748120110424816	13	2.5
20	Van Dijk J., 2005, Deepening divide Inequality in the Information Society	13	2.5

Table 12 shows the most cited reference and its sources in digital literacy during the period, 1992-2011. The highly cited reference is Cazden C, 1996, Harvard Educ Rev with 31 (6.1%) Articles, Followed By Gee Jp, 2003, What Video Games Have to Teach Us about Learning and Literacy, P1 with 30 (5.9%), and Warschauer M, 2003, Technology and Social Inclusion - Rethinking The Digital Divide, P1 27 (5.3%), least of the cited papers like Hull Ga, 2005, Writ Commun, Prensky M., 2001, Horizon, Van Dijk J., 2005, Deepening divide Inequality in the Information Society. It was clearly depicted in the above table.

Table 13-Keyword wise Distribution of Publications

Sl.No	Word	Records	Percent	LCS	GCS
1	Digital	209	40.8	123	4760
2	Literacy	165	32.2	73	2808
3	Information	102	19.9	50	2356
4	Learning	57	11.1	10	1022
5	Literacies	48	9.4	43	1157
6	Internet	43	8.4	26	2767
7	Technology	40	7.8	9	573
8	Use	38	7.4	19	1739
9	New	36	7	16	692

10	Education	34	6.6	4	589
11	Health	34	6.6	18	1234
12	Media	30	5.9	10	441
13	Age	29	5.7	5	350
14	Divide	27	5.3	29	1196
15	Students	26	5.1	2	309
16	Library	25	4.9	6	232
17	Based	24	4.7	4	267
18	Online	24	4.7	4	737
19	Computer	23	4.5	12	398
20	School	21	4.1	9	333

Table 13 has shown that majority of contribution output coming from 'Digital' with 209 (40.8%) papers, followed by Literacy with 165 (32.2%), Information 102 (19.9%), Learning 57 (11.1%), Literacies 48 (9.4%), Internet 43 (8.4%), Technology 40 (7.8%), Use 38 (7.4%), New 36 (7%), Education, Health 34(6.6%),Media 30 (5.9%), Age 29 (5.7%), Divide 27 (5.3%), Students 26 (5.1%), Library 25 (4.9%), Based and Online 24 (4.7%), Computer 23(4.5%), and School 21 (4.1%).

Conclusion

The study shows the publication pattern that totally depends on the literature, journal pattern, authorship pattern and the quality of research. Theresearch publication during the period between 1992-2011, 2008 and 2009 same contributions, and theyear 2011 shows the maximum number of contributions to the area of Digital literacy research output. TheHistcite analysis of literature growth on digital literacy research shows USA most productivity in this area.UK and Australia, Canada also involved in this area and contributing their research productivity.This studies can help the future researchers to establish future research directions.

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