Characteristics of Highly Cited Articles in Communication (1989 to 2018): A Web of Science-Based Analysis

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Characteristics of Highly Cited Articles in Communication (1989 to 2018): A Web of Science-Based Analysis

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This paper presents the characteristics of highly cited articles (HCA) in communication subject published from 1989 to 2018 using data from the SSCI of Web of Science. A total of 1108 articles (2.1%) were considered as highly cited articles (HCAs) in communication. Further, we have analyzed the year wise distribution of articles and their bibliometric attributes. Most productive authors, countries, and journals were identified. Cluster analysis of author-supplied keywords was performed, and the top cited ten article's citation life cycle was also examined.

Keywords: Communication, keyword analysis, bibliometric analysis, journals, cluster analysis, highly cited articles

According to Cooley communication is "a mechanism through which human relations exist and expand—all the symbols of the mind, together with the means of conveying them through space and preserving them in time" (Cooley, 1909). Renwick argues that "Responsible communication is very important in the democracy, without a large measure of sincerity on the part of the editor, spokesmen, and reporters, freedom of expression cannot survive" (Renwick, 1957). Reviewing of scholarly communication through analysis of bibliometric content of the articles published in the subject area are taking place in recent times (Seriwala, Khan, Shuaib, & Shah, 2015). Citation reflects credentials and impact of research (Huo et al., 2015). Aksnes and Sivertsen mentioned that analysis of highly cited articles characteristic could be a practical option to disclose the outstanding works (Aksnes & Sivertsen, 2004). Highly cited articles are vary and contributed by large numbers of authors involving international collaboration (Aksnes, 2003). Many authors have analyzed the highly cited articles in recent times (Ho, 2014; Kolle, Shankarappa, & Ho, 2017; Kolle, Vijayashree, & Shankarappa, 2017). Several authors have studied the HCA in particular subject category such as education and educational research (Ivanoviæ & Ho, 2016), horticulture (Kolle et al., 2017), health care services (Hsu & Ho, 2014), environmental and occupational health (Smith, 2010), and malaria research (Kolle et al., 2017). The bibliometric analysis of articles published in important journals in communication subject showed that the journal, *Human Communication Research* was the most influential journal within the communication subject (Reeves & Borgman, 1983). Similar kind of study was undertaken, and it was found that a little convergence between information science and communication

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(Borgman & Rice, 1992). One more interesting study found that top four journals in communications such as *Human Communication Research, Personal Relationships, Journal of Communication* and *Communication Research* (Feeley, 2008). However, no study was conducted to reveal the characteristics of highly cited articles in communication. Hence, the present study was undertaken to identify characteristics of HCAs in communication.

Objectives

This work aims to reveal the characteristics of highly cited articles (HCAs) in communication. The specific objectives of the work include: (i) to identify year wise distribution of HCAs in communication; (ii) to recognize the major contributors in the field, their affiliated and country wise contributions; (iii) to reveal the most productive journals; (iv) to perform cluster analysis of author keywords using VOS viewer software; (v) to identify sleeping beauties in the communication; and (vi) identify the characteristics and citation pattern of top-cited articles.

Methodology

We have collected the data from the SSCI of Web of Science Core Collection on 18 September 2018. Advance search technique was used as: WC: (communication) and Document Types: (Article) Period: 1989-2018. The schematic for the searching procedure for HCAs is provided in Figure 1. A total of 50,803 records were found in the search strategy. Further, the articles which have received at least 100 citations up to the 18th September of 2018 were used as criteria for the selection of HCAs (1,108 articles). Using this, 2.1% of total articles published in communication are considered as highly cited articles (HCAs). Bibliometric information of the 1,108 articles was downloaded into Excel. Microsoft Excel was used for analysis purposes. Cluster analysis of author supplied keyword was finished utilizing VOSviewer programming (van Eck & Waltman, 2017). The first and corresponding author was identified by author "affiliation information," and "corresponding author address fields" (Kolle, Shankarappa, Rahimi, & Satish, 2018). The country contribution was identified by "author affiliation," and "corresponding author address fields" (Kolle et al., 2018). The articles from England, Scotland, Northern Ireland, and Wales were grouped as from United Kingdom (Ho, 2012).
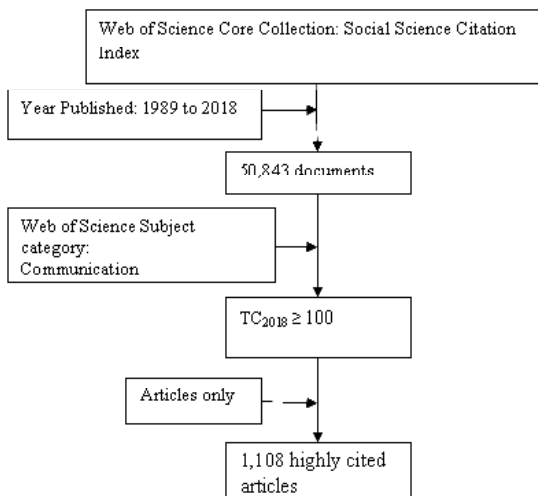

Figure 1. Schematic for searching the highly cited articles in communication

Results and Discussion

Publication Year

Table 1 provides the details about HCAs in communication. A total of 1,108 HCAs were published with an average of 36 articles per year. A total of 207,791 citations were recorded to 1,108 articles with an average of 188 citations per article. A total of 54,547 references were consulted to write 1,108 articles. The average references consulted for the writing articles also increased from 46 in 1989 to 56 in 2015. A total of 882 unique authors were involved in the research, and average authors for each article has risen from 1.8 in 1989 to 3 in 2014. In 1989, there were only 12 HCAs with a minimum of 100 citations, and the highest numbers of HCAs were published in the year 2004 (87 articles). This may be due to the emergence of new media such as the Internet and social networking site during the period.

Table 1. Year-wise distribution of highly cited articles in communication (with bibliometric characteristics)

PY	TP	TC	NR	AU	TC/TP	NR/TP	AU/TP
1989	12	1768	557	21	147	46	1.8
1990	22	5121	957	36	233	44	1.6
1991	27	4766	1163	57	177	43	2.1
1992	24	5939	1343	39	247	56	1.6
1993	26	7927	1242	46	305	48	1.8
1994	24	4526	1141	44	189	48	1.8
1995	29	4433	1427	56	153	49	1.9
1996	45	8844	1964	99	197	44	2.2
1997	43	7481	1779	81	174	41	1.9
1998	34	7081	1732	67	208	51	2.0
1999	50	10231	2621	111	205	52	2.2
2000	77	14270	3700	157	185	48	2.0
2001	56	9582	2605	132	171	47	2.4
2002	75	13545	3887	152	181	52	2.0
2003	66	10945	2980	134	166	45	2.0
2004	87	16867	4253	192	194	49	2.2
2005	68	12339	3675	157	181	54	2.3
2006	61	11156	3127	140	183	51	2.3
2007	61	11124	2724	145	182	45	2.4
2008	51	10023	2368	124	197	46	2.4
2009	70	12734	3444	161	182	49	2.3
2010	31	4480	2019	92	145	65	3.0
2011	25	4493	1313	81	180	53	3.2
2012	26	5768	1437	46	222	55	1.8
2013	11	1368	682	31	124	62	2.8
2014	6	865	351	18	144	59	3.0
2015	1	115	56	1	115	56	1.0
	1108	207791	54547	2420	188	49	2.2

PY, publication year TP, total highly cited articles TC, total citations, NR, number of references AU, number of authors TC/TP, average citations per article NR/TP, average references for each article AU/TP, average authors for each article.

No highly cited article emerges in the last three years. The articles entitled "Attribution in social and parasocial relationships" was published in the journal, *Communication Research* in February 1989 has received 120 citations till September 18, 2018 and the article has revealed that "parasocial relationships with favorite soap opera characters were based, to some extent, on reduction of uncertainty and the ability to predict the feelings and attitudes of the persona" (Perse & Rubin, 1989) accurately. The newest article that becomes the highly cited article within shortest time was published in "*Information Communication & Society*" in 2015 and entitled as "Social media use and participation: A meta-analysis of current research." The major finding of the study was that "social media use has the least impact on participation in election campaigns" (Boulianne, 2015). The articles published in the year 2004 have recorded the highest average citations per article (305). The main reason for this is, three articles published in this year have received more than 500 citations (Kaplowitz, Hadlock, & Levine, 2004; Krippendorff, 2004; Suler, 2004). Among three articles, the article entitled "The online disinhibition effect" one of the top ten HCAs in the dataset (Suler, 2004).

The trends in publication of HCAs with average citations for each article were illustrated in Figure 2. The trend indicates that from 1989 to 2004, the number of HCAs published were kept increasing, and after 2004, the number of HCAs published were kept decreasing. Similarly, the trend in the publication of HCAs with average authors for each article was illustrated in Figure 3. The average authors per HCAs was not a constant increase, but an increase from year to year may be observed.
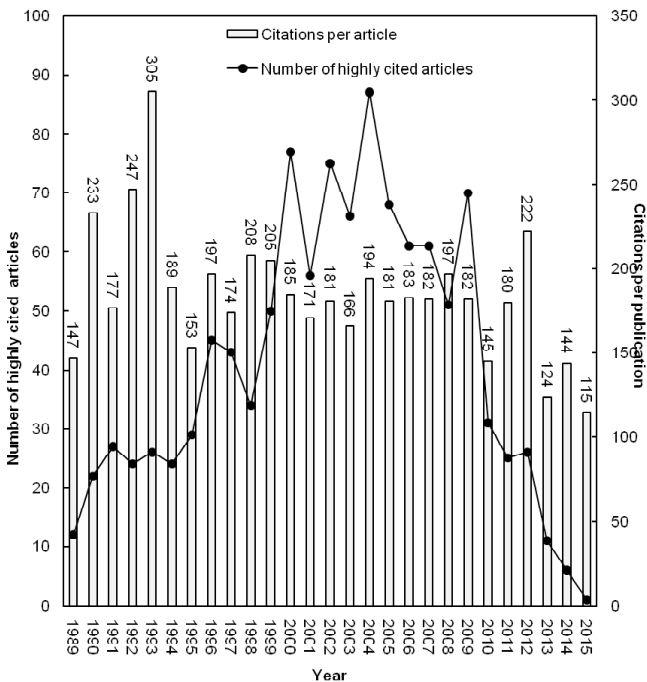

Figure 2. Trends in the publication of highly cited articles (HCAs) with average citations per article in communication
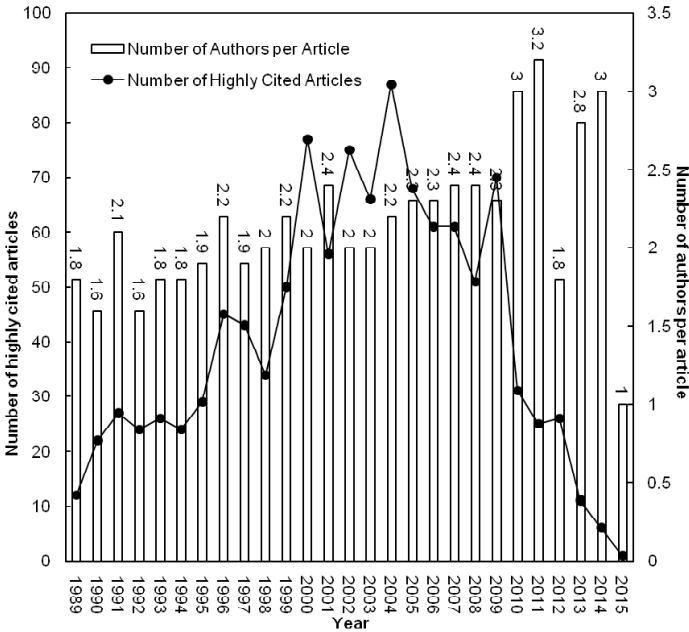
Figure 3.   Trends in the publication of highly cited articles (HCAs)
with average authors per article in communication

Author Prolific and Collaboration Network

Most productive authors with at least seven HCAs with first author articles, corresponding author articles, and a major collaborator were analyzed and presented in Table 2. Out of the 1,108 HCAs, 30% (335) of the HCAs were authored by a single author, the more than three authors contributed 38% (426) of HCAs by double authors, and 19% (216) of HCAs by three authors, and only 11.82 % of the HCAs. Form this result; it can be concluded that there is no relation between several authors contributed and becoming HCA. This finding is by disability-related fields (Ahmed, Adam, Ghafar, Muham-Mad, & Ebrahim, 2016). The finding is indifferent from the ecology subject and surgical literature, wherein those with more numbers of authors are cited more than with fewer numbers of authors (Fox, Paine, & Sauterey, 2016; Glynn, Kerin, & Sweeney, 2010). Of the 17 authors with at least 7 HCAs, 14 authors are from the USA, two from the Netherlands and one from England. In the case of environmental engineering, most of the productive authors were from the USA (Fu & Ho, 2018). In the case of analysis of most cited research works in Science Citations Index, most of the works were produced by the USA based authors (Ho, 2013). The Scheufele, D. A. from the University of Wisconsin, USA was ranked 1st in the contribution of HCAs in communication with 17 articles, followed by the Walther, J.B. (12 articles) from Michigan State University, USA. Eveland, W.P., Valkenburg, P.M., and Nisbet, M.C., have contributed 11 HCAs each. Ho proposed a new bibliometric indicator that the Y-index (j,h), "it is concerned with to numbers of first author articles (FP) and corresponding author articles (RP), and already be applied to evaluate authors, institutions, and countries, as defined;"

$$j = FP + RP \qquad (1)$$

$$h = \tan^{-1}\left(\frac{RP}{FP}\right) \qquad (2)$$

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"*J* is the sum of RP and FP, which denotes the publication quantity, and *h* is publication characteristics, which can denote the proportion of RP to FP" (Hsu & Ho, 2014). "When *j* is greater, the more contribution the analyzed unit makes." "Different values of *h* stand for different proportions of RP to FP, *h* > 0.7854 means more numbers of corresponding author articles; *h* = 0.7854 means the same quantity of first and corresponding author articles; 0<*h* < 0.7854 means number of first author articles" (Hsu & Ho, 2014). "When *h* = 0, *j* = number of first author articles and when *h* = π/2, *j* = number of corresponding author articles" (Fu & Ho, 2014). As per the *Y* index, the Walther J. B. ranked as a top author among them all. The highest values of the *j* parameter of *Y-* index of three authors were Walther, J. B., (*j* = 19, *h* = 0.837), Scheufele D. A. (*j* = 17, *h* = 0.844), and Lang A (*j* = 0.851, *h* = 15). These three authors have contributed more numbers of corresponding HCAs than first author HCAs. It may be noted that these three authors are playing a leadership role in the communication subject. Slater, M.D. has contributed similar numbers of first and corresponding author HCAs (*j* = 0.785, *h* = 16)

Table 2. Productive authors with their major collaborators

Authors	*R*(TP)	*R*(FP)	*R*(RP)	%	Institute	Major collaborator	*h*	Rank (*j*)
Scheufele DA	1 (17)	2 (8)	2 (9)	1.6	University of Wisconsin, USA	Brossard D (6 Articles)	0.844	2 (17)
Walther JB	2 (12)	1 (9)	1 (10)	1.1	Michigan State University , USA	Van Der Heide, B (3 Articles)	0.837	1 (19)
Eveland WP	3 (11)	4 (7)	5 (7)	1.0	Ohio State University , USA	Kwak N (3 Articles) Shah Dv (3 Articles) Mcleod Dm (3 Articles)	0.785	5 (14)
Valkenburg PM	3 (11)	9 (5)	11 (4)	1.0	University of Amsterdam Netherlands	Peter J (7 Articles)	0.674	9 (9)
Nisbet MC	3 (11)	6 (6)	8 (6)	0.8	Ohio State University, USA	Brossard D (5 Articles)	0.785	7 (12)
Shah DV	4 (10)	9 (5)	9 (5)	0.9	University of Wisconsin USA	Kwak N (4 Articles) Eveland Wp (3 Articles)	0.785	8 (10)
Lang A	5 (9)	4 (7)	3 (8)	0.7	Washington State University, USA	Bolls, P (2 Articles) Potter R (2 Articles)	0.851	4 (15)
Brossard D	6 (8)	6 (6)	43 (2)	0.7	University of Wisconsin, USA	Nisbet Mc (5 Articles)	0.785	10 (8)
Livingstone S	6 (8)	4 (7)	5 (7)	0.7	University of London, England	Helsper, Ej (3 Articles)	0.785	5 (14)
Peter J	6 (8)	39 (2)	42 (2)	0.7	University of Amsterdam, Netherlands	Valkenburg Pm (7 Articles)	0.785	12 (4)
Slater MD	6 (8)	2 (8)	3 (8)	0.7	Colorado State University, USA	Rouner, D (4 Articles)	0.785	3 (16)
Mcleod DM	7 (7)	20 (3)	21 (3)	0.6	University of Delaware, USA	Eveland Wp (3 Articles) Detenber, B (3 Articles)	0.785	10 (6)
Papacharissi Z	7 (7)	8 (6)	5 (7)	0.6	University of Illinois, USA	-	0.862	6 (13)
Presser S	7 (7)	40 (1)	43 (1)	0.6	University of Maryland, USA	Singer, E	0.785	13 (2)
Groves RM	7 (7)	9 (5)	11 (4)	0.6	University of Michigan, USA	Presser, S (2 Articles)	0.674	9 (9)
Gunther AC	7 (7)	4 (7)	5 (7)	0.6	University of Wisconsin, USA	-	0.785	5 (14)
Krosnick JA	7 (7)	39 (2)	21 (3)	0.6	Ohio State University, USA	Holbrook, A (2 Articles) Visser, P (2 Articles) Chang, I (2 Articles)	0.982	11 (5)

R-Rank, TP- total HCAs, FP- first author HCAs, RP- Corresponding author HCAs.

The author collaboration network is displayed in Figure 4. Scheufele, D.A. has collaborated with more numbers of authors, and his major collaborator was Brossard, D. followed by the Shah, D. V., Eveland, W.P., and Nisbet, M. C. These authors had worked on the topics such as framing the media effects (Scheufele & Tewksbury, 2007), agenda setting for local news (Kim, Scheufele, & Shanahan, 2002), and public attitude towards emerging technologies (Lee, Scheufele, & Lewenstein, 2005). Eveland, W.P was the one more author who collaborated with Kwak, N., Shah, D. V., and Mcleod, D. M. These authors worked on the topics such as modeling technology effect on the civic participation (Shah, Cho, Eveland, & Kwak, 2005), media usage and democratic process (McLeod et al., 1996) and third-person effect (McLeod, Detenber, & Eveland, 2001). Brossard, D. also collaborated with more number of authors and his major collaborator was Nisbet, M.C. The authors worked on the topics such as framing the science communication (Ho et al., 2008; Nisbet et al., 2003) and media effect models towards S&T (Nisbet et al., 2002). Mcleod, J.M., was also worked with many authors such as Scheufele DA., Holbert, RL., Eveland, WP; and Shah D V. These authors worked on topics such as political participation (McLeod, Scheufele, & Moy, 1999) and media use and democracy (McLeod et al., 1996).
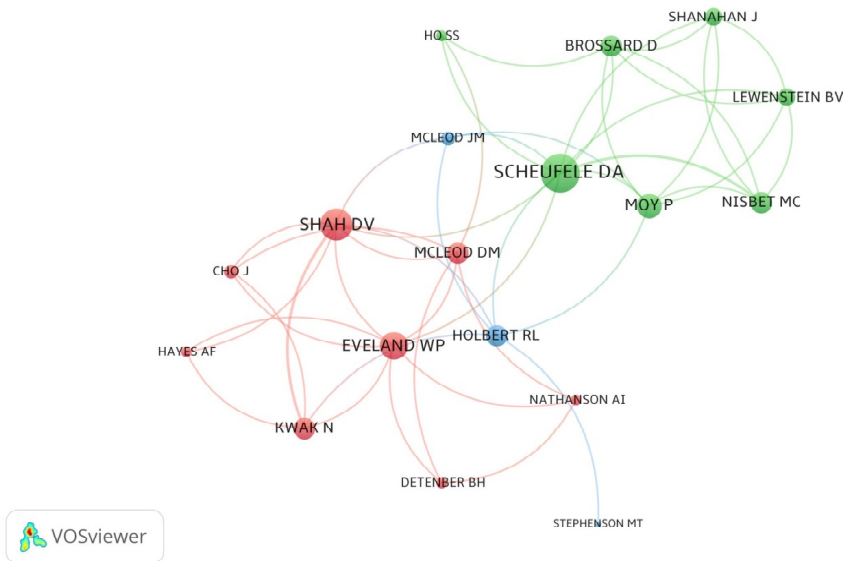

Figure 4. Collaboration network of most productive authors in communication

Productive Journals and Countries in Communication

The 1,108 HCAs were produced by the 51 journals with an average of 21.7 HCAs for each journal. *Journal of Communication* was most productive journal with 95 HCAs (9%), followed by the *Cyber-psychology Behavior* (89. 8%), *Public Opinion Quarterly* (83. 8%), *Communication Research* (75. 7%), *Journal of Advertising* (61. 6%) and *New Media & Society* (45. 4%). These top six journals have contributed almost 42% of the HCAs in communication. The impact factor of the journals is provided and *Journal of Computer-Mediated Communication"* was the journal with higher impact factor (4) has contributed 25 HCAs with average citations of 203 per article which is higher than the average citations (188) of all HCAs. While *"Personal Relationships"* journal as listed in Table 3 was with lowest impact factor *(*0.906) and has published 28 HCAs and the average citations (180) was lowest than all HCAs in the dataset.

The *MIS Quarterly* published 26% of HCAS in information science and library science subject (Ivanovic & Ho, 2016). *Child Abuse and Neglect* and *American Journal of Community Psychology* published the most HCAs in social work (Ho, 2014). The *Statistics in Medicine* and *Medical Decision Making* were the most productive journals in the medical informatics (Nadri, Rahimi, Timpka, & Sedghi, 2017).

Table 3. Most productive journals publication of highly cited articles (HCAs) in communication

Journal	TP	%	IF$_{2017}$
Journal of Communication	95	9	3.729
Cyber-Psychology Behavior	89	8	2.689
Public Opinion Quarterly	83	8	2
Communication research	75	7	3.391
Journal of Advertising	61	6	2.88
New Media & Society	45	4	3.121
Human Communication Research	43	4	2.364
Political Communication	38	4	2.738
Journal of Advertising Research	37	3	2.328
Journal of Social and Personal Relationships	32	3	1.697
Journal of Broadcasting Electronic Media	29	3	1.773
Public Understanding of Science	29	3	2.452
Communication Theory	28	3	2.733
Personal Relationships	28	3	0.906
Journal of Computer-Mediated Communication	25	2	4
Journal of Health Communication	25	2	1.648
Public Relations Review	22	2	1.378
Communication Monographs	21	2	1.894
Discourse & Society	19	2	1.339
Journalism & Mass Communication Quarterly	19	2	1.706
Research on Language and Social Interaction	16	1	1.826
European Journal of Communication	14	1	1.5
Media Culture & Society	13	1	1.305
Health Communication	12	1	1.71
Journal of Language and Social Psychology	12	1	1.233

TP- total highly cited articles %-percentage of 1108 articles IF$_{2017}$-Impact factor of the journal as per the Journal Citation Report 2017

Table 3 provides the top 14 countries ranked by the number of HCAs in communication. Only 35 countries have contributed to the HCAs in communication. The countries such as India, New Zealand, Russia, Portugal, Uganda, Chile, Romania, Estonia, Denmark, Mexico, Brazil, Egypt had contributed single HCA. The USA was ranked 1st with 790 HCAs (71%), followed by the England (Ranked 2nd; 98. 9%), Canada (Ranked 3rd; 49. 4%), Netherlands (Ranked 4th; 48. 4%) and Germany (Ranked 5th; 31. 3%). A similar finding was noticed in the wind tunnel related research and biomass research (Chen & Ho, 2015; Mo, Fu, & Ho, 2018).

Table 4. Most productive countries

Country	R (TP)	% of 1108
USA	1 (790)	71
England	2 (98)	9
Canada	3 (49)	4
Netherlands	4 (48)	4
Germany	5 (31)	3
Australia	6 (23)	2
South Korea	7 (14)	1
Israel	8 (13)	1
Taiwan	8 (13)	1
Spain	9 (12)	1
Peoples R China	10 (9)	1
Sweden	11 (9)	1
Belgium	12 (8)	1
Italy	12 (8)	1

TP, the total number of highly cited articles; R, rank

The collaborative network between the countries is illustrated in Figure 5. The USA has collaborated with 25 countries. The USA is playing a leadership role in research work in communication. The Cluster analysis of the countries was performed using VOSviewer software (van Eck & Waltman, 2017). The countries grouped under Cluster 1 were Australia, China, Singapore, Taiwan, and the USA. The countries grouped under Cluster 2 were Canada, France, Norway, and Sweden. Cluster 3 contains four countries: Chile, Israel, Spain, and Turkey. The Cluster 4 contains three countries: Germany, Italy, and Switzerland. The Cluster 5 contains three countries: the Czech Republic, England, and Scotland. Cluster 6 contains two countries: Belgium and the Netherlands, and Cluster 7 contain two countries: Korea and Japan.
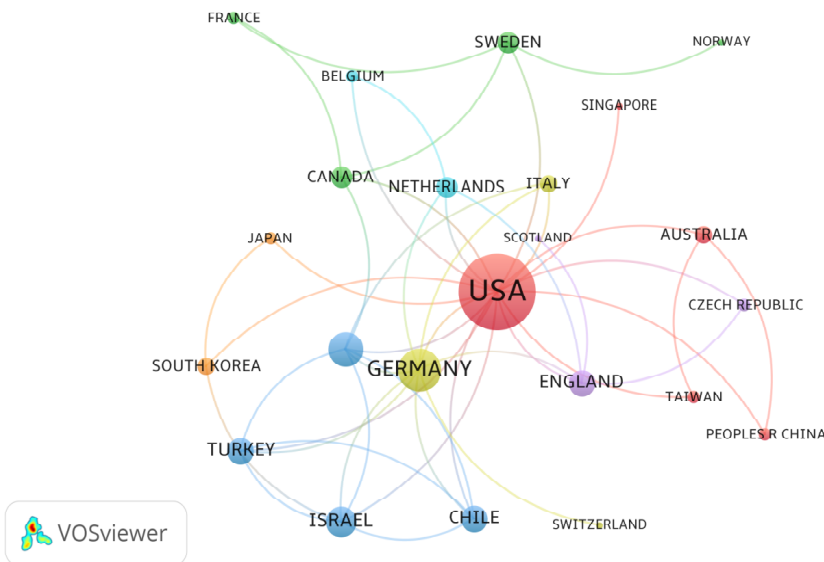

Figure 5. Collaborative networks between the countries

Cluster Analysis of Author-Supplied Keywords

The author supplies a minimum of four to five keywords while submission to the journal. The cluster analysis of author-supplied keywords with the help of VOSviewer was done (Sweileh, 2018). Of the 1,108 HCAs, 922 HCAs were contained the author-supplied keywords. The cluster analysis of the author-supplied keywords is illustrated in Figure 6. Cluster 1 contains the keywords: framing, journalism, content analysis, political communication, blogs, political parties, public sphere, blogs, and nanotechnology. It confirms from this that some part of the research was concerned with framing the news and its effects (McLeod & Detenber, 1999; Semetko & Valkenburg, 2000), and public perception about nanotechnology (Macnaghten, Kearnes, & Wynne, 2005; MacOubrie, 2006). Cluster 2 contains the keywords: Social media, Facebook, Twitter, Social network sites, social movement, and nonprofit organization. This confirms that second major research was concerned with social media and its use (Park, Kee, & Valenzuela, 2009; Valenzuela, Park, & Kee, 2009), how the NGOs using Facebook for engaging stakeholders and use of Facebook (Waters, Burnett, Lamm, & Lucas, 2009), Twitter for political communication (Enli & Skogerbø, 2013) and use of social media for social movement (Carroll & Hackett, 2006; van Laer & van Aelst, 2010). Cluster 3 contains the keywords: democracy, deliberation, discourse analysis, and persuasion. This confirms that some of the important works were related to challenges for democracy (Mazzoleni & Schulz, 1999), online discussions forums in democracy (Wright & Street, 2007), and discourse analysis of news reporting (Teo, 2000).

The Cluster 4 includes internet, digital divide, social support, gender, and civic engagement. Some of the studies were concerned with the use of the internet (Korgaonkar & Wolin, 1999), exploring the digital divide (Rice & Katz, 2003; Templin, 1999). The Cluster 5 contains the keywords: crisis communication, credibility, trust, social capital, and computer-mediated communication. This confirms that some of the works were related to the use of social media for crises communication (Schultz, Utz, & Göritz, 2011; Sweetser & Metzgar, 2007; Seeger, 2006), credibility of online information sources (Flanagin & Metzger, 2007; Hu & Sundar, 2010), and building social capital with use of social media (Gil de Zúñiga, 2012; Shah, Kwak, & Holbert, 2001), The Cluster 6 contains the keywords: political participation, television news, political knowledge, and newspapers. The some of the works in the dataset concerned with use of social media and political participation (Bakker & de Vreese, 2011; Gil de Zúñiga, 2012; Polat, 2005), television news analysis (Aday, Livingston, & Hebert, 2005; Gilboa, 2005) and political knowledge (Bonfadelli, 2002; Eveland, 2004; Prior, 2003). The Cluster 7 contains the keywords: communication, discourse, and learning. This confirms that some of the works were related to use of social media for communication (Briones, Kuch, Liu, & Jin, 2011), interpersonal relationship and students learning (Frymier & Houser, 2000) and learning politics from mass media (Chaffee & Kanihan, 1997). The Cluster 8 contains the keywords: media effects, new media, public relations, and interactivity. Some of the works were related to media effects (Brown & L'Engle, 2009; Slater, Henry, Swaim, & Anderson, 2003), role of new media (Baum & Groeling, 2008; Livingstone, 2004), use of social media for public relations (Lovejoy & Saxton, 2012; Rybalko & Seltzer, 2010) and media interactivity for political purposes (Sundar, Kalyanaraman, & Brown, 2003).
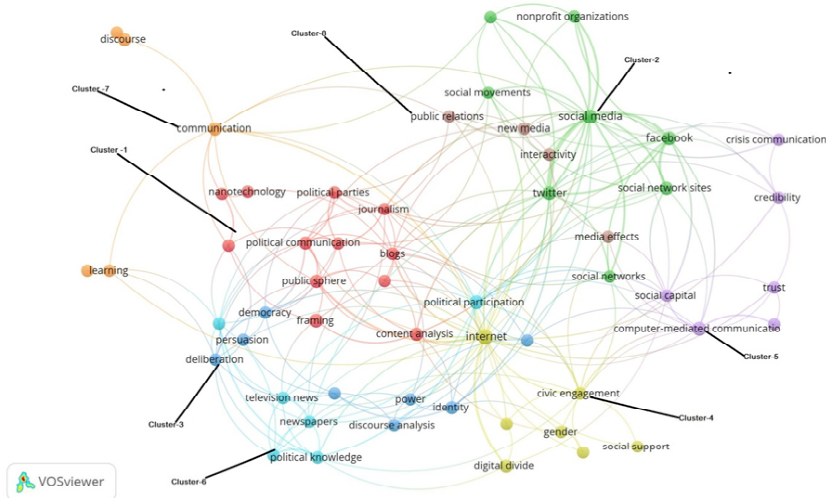
Figure 6. Cluster analysis of author-supplied keywords in communication

Characteristics and Citation Lifecycle of Top Cited Articles

The uniqueness of the top ten most cited articles in horticulture was investigated (Kolle et al., 2017). The articles with cited at least 859 times (TC$_{2018}$ e″859), average citations per year, and citations in the year 2018 is presented in Table 5. Of the ten articles, two articles published in 1992 (Steuer, 1992; Witte, 1992), each in 1990 (Bartholomew, 1990), 1993 (Entman, 1993), 1996 (Walther, 1996), 1999 (Scheufele, 1999), 2002 (Lombard, Snyder-Duch, & Bracken, 2002), 2004 (Suler, 2004), and 2012 (Boyd & Crawford, 2012). This confirms that time is not a significant reason for the articles to be highly cited. Three articles published in *Journal of Communication* (Entman, 1993; D A Scheufele, 1999; Steuer, 1992), and each in *Communication Research* (Walther, 1996), *Communication Monographs* (Witte, 1992), *Information Communication & Society* (Boyd & Crawford, 2012), *Public Opinion Quarterly* (Groves, 2006), *Journal Of Social And Personal Relationships* (Bartholomew, 1990), *Human Communication Research* (Lombard et al., 2002), and *Cyberpsychology & Behavior* (Suler, 2004). Of the ten articles, nine articles were produced by the USA based authors and one by England. The article ranked 1st in total citations (3225), and total citations in 2018 were entitled as "Framing – toward clarification of a fractured paradigm." The article provides clarity of news framing, how the frames work, and benefits of a consistent concept of framing (Entman, 1993). The work has become a major road map in the framing research since its publication. One more important article becomes the second most highly cited article entitled "Computer-mediated communication: Impersonal, interpersonal, and hyperpersonal interaction." In this article, the author has discussed the subprocess concerned with receivers, senders, channels, and feedback aspects in computer-mediated communication (Walther, 1996). One more interesting article which is published in the recent times and ranked 1st in the average citations per year was entitled as "Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon." The article has received an average of 145 citations per year. The article provides an account of role of big data and limitations of the big data (Boyd & Crawford, 2012). One more article which has received significant numbers of citations and ranked 4th in total citations in 2018 was entitled as "The online disinhibition effect."

Table 5. Characteristics of top-cited ten articles in communication

R (TC_{2018})	R (ACPY)	R (C_{2018})	Title	Reference
1 (3225)	2 (124.04)	1 (265)	Framing - toward clarification of a fractured paradigm	(Entman, 1993)
2 (1332)	5 (57.91)	16 (66)	Computer-mediated communication: Impersonal, interpersonal, and hyper personal interaction	(Walther, 1996)
3 (1089)	23 (40.33)	9 (77)	Defining virtual reality - dimensions determining telepresence	(Steuer, 1992)
4 (1071)	24 (39.67)	5 (87)	Putting the fear back into fear appeals - the extended parallel process model.	(Witte, 1992)
5 (1015)	1 (145)	2 (180)	Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon.	(Boyd & Crawford, 2012)
6 (994)	4 (76.46)	11 (71)	No response rates and no response bias in household surveys.	(Groves, 2006)
7 (944)	16 (47.2)	22 (58)	Framing as a theory of media effects.	(D A Scheufele, 1999)
8 (891)	56 (30.72)	63 (35)	Avoidance of intimacy - an attachment perspective	(Bartholomew, 1990)
9 (876)	12 (51.53)	6 (84)	Content analysis in mass communication: Assessment and reporting of intercoder reliability.	(Lombard et al., 2002)
10 (859)	6 (57.27)	4 (95)	The online disinhibition effect	(Suler, 2004)

$TC_{2018,}$ total citations up to 2018, ACPY, average citations per year $C_{2018,}$ total citations in 2018

The citation pattern of the top seven articles in communication is illustrated in Figure 7. The citations life cycle top six articles in wetland research was performed (Ma, Fu, & Ho, 2013). The two articles have attracted several citations since the Entman, and Boyd, and Crawford contributed their publication. The articles were kept receiving more number of citations from year to year. It confirms that these two articles have influenced the fellow researchers in the subject field of communication. The sleeping beauty is that article goes unnoticed for some time and later attracts lots of attention in the subject (van Raan, 2004). The article contributed by the Steuer entitled as "Defining virtual reality - dimensions determining telepresence" has attracted very fewer citations initially and from the year 2004 started receiving more number of citations, and it can be noted as sleeping beauty in the communication subject and 2017, it has received 122 citations. This article was more innovative as this was predicting the changes that may take place in communication due to advacnement in technology. The article provides a set of dimensions to help in measuring and predicting virtual reality may occur and it can motivate further communication (Steuer, 1992). One more interesting article that can be called as a sleeping beauty was contributed by the Witte entitled as "Putting the fear back into fear appeals. The extended parallel process model." Initially, this article also has received few citations after 2008 it started attracting more number of citations, and in 2017, it received 122 citations. This work is further expansion of previous studies (Janis, 1967; H. Leventhal, 1971; Howard Leventhal, 1970; Maddux & Rogers, 1983).
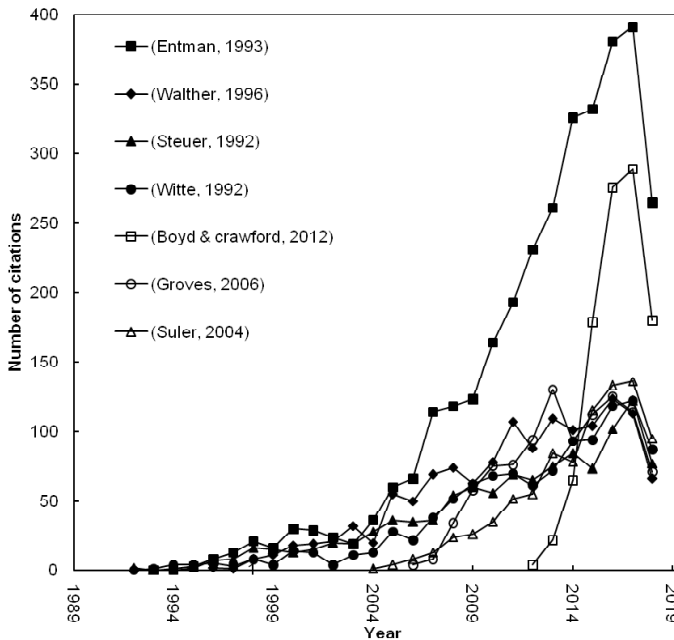
Figure 7. Citation life cycle top cited seven articles in communication

Conclusion

We have reviewed the characteristics of highly cited articles (HCAs) in the subject category of communication. Most of the HCAs were published in the year 2004. The articles published in the year 2003 have received the highest average citations per articles, and most of the articles were written by one to two authors only. Scheufele D.A. was the most productive author, and most of the productive authors were from the USA. The five journals contributed for the publication of most HCAs were *Journal of Communication, Cyber-Psychology & Behavior, Public Opinion Quarterly, Communication Research, and Journal of Advertising. The* USA was the leader in the production of highly cited articles in communication. The major portion of the research was concerned with political participation, science communication, social networking, new media, political parties, media effects, digital divide, discourse analysis, content analysis, and civic engagement. We have identified two sleeping beauties in the communication: (i) "Defining virtual reality—dimensions determining telepresence" by Steuer and (ii) "Putting the fear back into fear appeals - the extended parallel process model" by Witte. Both articles can attract more citations in the future. This article might be useful to the researchers to know the characteristics of HCAs in communication.

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