ANALISIS KEUSANGAN DAN PRODUKTIVITAS PENGARANG MENGGUNAKAN HUKUM LOTKA PADA JURNAL KEWIRAUSAHAAN PADA TAHUN 2015-2019

ANALYSIS OF OBSOLESCENCE AND PRODUCTIVITY OF AUTHORS USING LOTKA LAW ON THE JOURNAL OF ENTREPRENEURSHIP IN 2015 – 2019

Rhoni Rodin[1], Eka Apriani [2]

[1] *Departement of Library and Islamic Information Science, Faculty of Ushuluddin, Adab and Dakwah, IAIN Curup, Rejang Lebong, Bengkulu, INDONESIA*
[2] *Departement of Library Science, Faculty of Adab and Humanities, UIN Raden Fatah, Palembang, INDONESIA*

Abstrak. Penelitian ini dilakukan untuk mengetahui tingkat keusangan sebuah karya sastra dan produktivitas penulis dengan hukum lotka dalam karya sastra tentang kewirausahaan tahun 2015-2019. Metode penelitian yang digunakan adalah metode penelitian kuantitatif dengan melakukan analisis sitasi. Dalam menganalisis data, data dikumpulkan, diserahkan, diolah, kemudian disajikan dalam bentuk tabel dan grafik. Hasil penelitian adalah tingkat keusangan literatur dengan artikel berjudul "Pengaruh Perilaku Kewarganegaraan Organisasi Terhadap Kinerja dengan Kualitas Layanan, Kepuasan dan Niat Perilaku sebagai Anteseden" dengan keusangan literatur dan waktu paruh 17 tahun terakhir. Waktu tersingkat keusangan sastra hanya 5 tahun, artikel yang berjudul: "Pengaruh Penggunaan Pembelajaran Kooperatif Tipe *Think-Pair-Share* (TPS) Terhadap Hasil Belajar Kewirausahaan Siswa Kelas X Semester Genap SMP Kartikatama 1 Metro TP 2015 /2016". Kemudian untuk perhitungan penulis yang sering dikutip yaitu I Ghozali, Singh, Sangeeta, Wafa, S.A dan Suharti L. Masing-masing penulis artikel adalah penulis dengan peringkat kedua pada mata kuliah kewirausahaan. Sebagian besar penulis menghasilkan satu artikel. Penulis paling produktif menghasilkan 4 artikel dan peringkat pertama yaitu Wiliams, kemudian Muhammad Hassan dan Berry L berada di posisi kedua dengan menghasilkan 2 artikel sedangkan peringkat ketiga ditempati penulis yang menghasilkan 1 artikel sebanyak 156 penulis. Berdasarkan pengujian hukum Lotka pada pasal Kewirausahaan memiliki nilai eksponensial (n) 3,7537, dengan himpunan (C) 0,9127 atau 91,27%. Dari grafik terlihat bahwa terdapat hubungan antara jumlah pengarang dengan jumlah artikel yang dihasilkan seperti pada undang-undang lotka. Semakin sedikit jumlah penulis, semakin banyak artikel yang dihasilkan.

Kata kunci: Produktivitas, Keusangan, Hukum Lotka, Kutipan.

Abstract. This study was conducted to determine the level of obsolescence of a literary work and the productivity of writers with the law of lotka in literary works about entrepreneurship in 2015-2019. The research method used is a quantitative research method by conducting citation analysis. In analyzing data, data is collected, submitted, processed, and then presented in the form of tables and graphs. The result of the study is the level of literature obsolescence with an article entitled "The Influence of Organizational Citizenship Behavior on Performance with Service Quality, Satisfaction and Behavioral Intentions as Antecedents" with literature obsolescence and half-life of the last 17 years. The shortest time of literary obsolescence is only 5 years, the article entitled: "The Influence of the Use of Think-Pair-Share (TPS) Cooperative Learning on Entrepreneurship Learning Outcomes of Class X Even Semester SMP Kartikatama 1 Metro TP 2015/2016". The most frequently cited authors are I Ghozali, Singh, Sangeeta, Wafa, SA and Suharti L. Each of the authors of the article is the second ranked author in the entrepreneurship course. Most of the authors produced one article. The most productive author produced 4 articles and the first rank was William , then Muhammad Hassan and Berry L were in second place by producing 2 articles, while the third rank was occupied by writers who produced 1 article as many as 156. Based on Lotka's legal test on the Entrepreneurship article, it has an exponential value (n) 3.7537, with the set (C) 0.9127 or 91.27% From the graph it can be seen that there is a relationship between the number of authors and the number of articles generated as in the lotka law. The fewer the number of authors, the more articles generated.

Keywords: Productivity, Obsolescence, Lotka's Law, Citation.

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[1] *email: rhoni.rodin@iaincurup.ac.id*

INTRODUCTION

Scientific writing can be abbreviated as scientific paper is a written report that describes the results of a research or study of a problem by a person or a team by fulfilling scientific principles and ethics that are confirmed and obeyed by the scientific community. The results of scientific work serve as a means to develop science and technology that can be used continuously, in the form of predictive explanations and supervision (Hermawan, 2019). A scientific work in a university usually results from research conducted by the academic community. To find out about scientific papers we can use bibliometric studies. Bibliometrics examines the distribution of publications quantitatively against the literature, so that bibliometrics are known to have three basic propositions in their quantitative analysis. These propositions are Lotka's Theorem, Zipf's Theorem, and Bradford's Theorem.

Lotka's argument, which is the argument for calculating the distribution of author productivity within a certain period of time in journal publications (N. dan L. Hayati, 2017). Literature obsolescence has not been widely studied in Indonesia. Not many have conducted studies on obsolescence because

the development of collections in the library itself is still low. So that the study of obsolescence is still not so glanced at the library. However, in perputsakan weeding activities are carried out, namely the activity of sorting out collections in the library, seeing whether the information is still relevant or not with the development of science. Obsolescence (B. Mustofa, 2010). obsolescence is one of the bibliometric studies that relates to the decline in the use of literature or groups of literature on certain subjects and over a certain period of time. This can happen because the age of the literature is considered irrelevant with the development of a particular scientific study. a document is said to be obsolete, is when controlled documents have been declared no longer valid or have exceeded the shelf life determined according to the needs of each work unit (Anggrainingsih, 2011).

Apart from obsolescence, bibliometric studies also discuss author productivity. On this occasion, the author wants to know the author's productivity on the subject of entrepreneurship by testing using Lotka's law and the obsolescence of his literature.

Much research has been done regarding obsolescence and productivity of this author.

This paper describes the statistical methods used to test the correlation between the author and the amount of articles produced, K-S test, a statistical test that is classified into Nonparametric Statistics, used to test the degree of closeness of two sets of data or two distribution (Goodness of fit). From the result this study the author of the Berkala Arkeologi journal in this years 1980-2009 is 138 people. Articles written as many as 392 articles. Based on calculations by the law of Lotka it is found that the productivity of authors for each article is a result of 44.816%, the author of two articles which generate as much as 18,003%, the author of many articles as 10.560% produces 3 and so on (Bayu Indra Saputro, 2011).

The results showed that Haryono was a productive writer (24 articles), followed by Dewi Malia Prawiradilaga and Renny K Hadiaty with 23 articles each, followed by Rosichon Ubaidillah (19 articles) and Sri Hartini (18 articles). Dewi Malia Prawiradilaga contributed the highest level of author collaboration with a collaboration frequency of 22 articles, followed by M Zein, Renny K Hadiaty, Sri Hartini, and Sri Sulandari with 17 articles each. The mean level of author collaboration was 0.84. This figure is a positive criterion for assessing the higher quality of the

research produced (Sri Wulan, 2014).

There is another study that examines sociology articles using bibliometric studies. A bibliometric study of this article is important to determine the development of sociology. This study aims to determine obsolescence, half-life, and to find out the results of ZIPF's postulate for 2015-2018. Where the results of the research show that the half of life in the Sociology article is the highest, which is 24 years, and the zipf postulate of this Sociology article has the highest word ranking, namely the 11th rank of the article entitled Adolescent Behavior Using Gadgets: Sociological Analysis of Educational Theory (Rhoni Rodin dan Nur Afifah, 2019).

As for the formulation of the problem in this study are 1) In what year the literature on the subject of Entrepreneurship is obsolete in 2015-2019 ?; 2) What is the productivity level of entrepreneurial journal authors 2015-2019 ?; and 3) Does the lotka test match the productivity of the journalists of Entrepreneurship 2015-2019?

While the objectives of this study are 1) To determine the year of obsolescence of literature on the subject of entrepreneurship 2015-2019; 2) To determine the productivity level of entrepreneurial journal authors 2015-2019; and 3) To find out the results of

the lotka law test on the productivity of the author of the entrepreneurship subject article.

METHODS

The data collection method used is quantitative research methods by conducting citation analysis. In this study, the cited data used were article pad with the subject of Entrepreneurship in 2015-2019. In analyzing data, data is collected, submitted, processed and then presented in tables and graphs.

LITERATUR REVIEW

Citation

The word citation is a translation of the word citation or citation in English. Citizens are works that are used as a bibliography in an article or book. Thus, the data studied in citing analysis is the bibliographic data that is cited and that is contained in the reading list (bibliography) of the citing documents. The definition of citation in Harrod's Librarian Glossary and Reference Book is a reference that refers to a document where the text is contained either in a text or part of a text. According to Sulistyo-Basuki sitiran is a work that is referred to or used as a bibliography in an article or book (Hasugian, 2005).

So citation is the work that is referred to or used whether it is in a text or part of the text that is used as a bibliography in an article

or book. While citation analysis is an analysis of a bibliography or intera text in a scientific work. The activity carried out is to carry out investigations of cited data in the document. In citation analysis, what is seen is not only cited data but also cited data.

Citations usually appear in footnotes, bibliometric endnotes or bibliographies (N. Hayati, 2016). The scope of citation analysis in bibliometrics includes three types of literature, namely primary, secondary and tertiary literature. The higher the number of citations for a magazine or journal, it is certain that the magazine / journal is of higher quality and is considered relevant to the research being carried out. Citation analysis is applied to determine the characteristics of the literature cited by scientists and other researchers, besides that it is also used to see the characteristics of literature literature in a study which includes the number of citations, types of documents cited, the origin of documents, age of citation, magazines and journals cited, and cited journals, and frequently cited authors.

In conducting research, not all related documents can be directly cited or cited. Documents cited by researchers are documents that are relevant to scientific research activities carried out. The documents

cited must be up to date. Then the document must be reviewed through an obsolescence study (Rahmah, 2011).

The benefits of citation analysis are evaluation of research programs, determination of science, visualization of a scientific discipline, science and technology indicators, impact factors of a journal, the quality of a journal, development of journal collections and so on.

Literature obsolescence

Literature obsolescence is a bibliometric study of the use of documents (literature) relating to the age of the literature(B. Mustofa, 2010). Through this study, it will be known that old collections are rarely used by users, and vice versa. Through obsolescence analysis can be applied in the library to find outdated literature and find out the latest literature and for policy decision making in the library. When the literature is considered obsolete, a weeding policy will be implemented and so on. Because users want the latest information, especially information that will be used as reference material in research. Current information affects the development of knowledge for the future. Observation of obsolescence is an interpretation of changes in the use of documents within a certain time.

According to Hartinah, there are two types of obsolescence of literature, namely (Rahmah, 2011):

1) Diachronous obsolescence, is a measure of the obsolescence of literature from the literature group by examining the year of publication of the citations received by the literature. The half-life is a measure of diachronous obsolescence

2) Synchronous obsolescence, is a measure of the obsolescence of literature from a group of literature by examining the year of publication of the literature reference. The median citation age was included in synchronous observations.

The problem of obsolescence concerns library materials that need to be put in a warehouse or that need to be thrown away. Obsolescence is based on the assumption that one day a publication is useless at a certain time and it will even disappear. The less used the document, the more obsolete the document is. Literature obsolescence is associated with a document and obsolete information contained in a document. The obsolescence of a document is more practical than informative. Obsolescence is practical, in the sense that if a document is outdated there is a possibility that the document can be placed in a certain place, such as a warehouse

or thrown away (123dok, n.d.).

Literature obsolescence can be used as an indicator to determine the latest literature and the speed of literature growth can show growth in the field of science.

Author Productivity

Author productivity is the number of papers produced by an individual on a particular subject and published in scientific journals on the subject concerned within a certain period of time. In a well-known bibliometric study, there are three laws for analyzing literature, namely Bradford's Law to determine the core journal of a particular object, Zipf's Law to calculate the frequency of occurrence of words contained in a document, and Lotka's Law to calculate author productivity (Dewiyana, 2010). The author's productivity is related to the quantity and quality of a person's performance performed optimally for a specific purpose. Author productivity is the number of works produced by a person in certain scientific subjects, either in printed or electronic form, published in scientific journals. Likewise, authors who produce scientific work, they will continue to improve or update their research in certain fields of science or they will be more motivated to write more often either by

collaborating or doing research individually (Farida, 2010). The productivity of an author can be seen from the results of his published work. The value of author productivity can give us an idea of the authors who are most productive in producing work for a certain period of time. Scientific journals are needed by the public because they have the latest information obtained from research results from researchers. In a scientific journal, each article contained in it is written by competent authors in their respective disciplines.

There are 3 ways to measure the author's productivity, namely:

1) Normal Count = Complete Count (complete count) is one way to determine how many articles written by the author. In multiple cases, each author is considered to be writing one article.

2) Adjusted Count = Fractional Count (adjustment count) is one way to determine how many articles written by the author. In double authorship, a person is deemed to have written one article divided by the number of authors.

3) Straight Count = Senior Count (straight count / direct) is one way of counting several articles written by the author. In double authorship, only the main author is taken into account, while the second author and so on

are ignored.

Lotka's law describes the researcher's productivity problems in a population. The general equation made for the lotka's proposition is:

$$Y_x = \frac{c}{x^n}$$

Information:

X = The number of articles contributed by the author individually

Yx = Number of authors who contributed x articles

C = The number of authors who contribute 1 article which is a constant in a particular model.

In Lotka law we can know the level of productivity of authors in scientific journals, authors who are most productive in scientific journals and authors who are most frequently cited by other authors in scientific journals. Here is Lotka's argument that we need to know:

"The more articles written, the fewer authors who write them" and conversely "the more journal authors, the fewer articles are produced by each individual".

RESULT AND DISCUSSION

In this study, researchers used the entrepreneurial subject from 2015 to 2019

with two articles each with the number of individual and collaborative researchers.

LITERATURE OUTDOOR TABLE

Literature Table "The Effect of Organizational Citizenship Behavior on Performance with Service Quality, Satisfaction and Behavior Intention as Antecedents" in 2015

Year of publication Citations	Number of citations of	Obsolescence
2006	1	Outdated Literature Of The Influence Of Organizational Citizenship Behavior On Performance With Service Quality, Satisfaction And Behavior Intention As Antecedents Of 1998.
2005	1	
2004	1	
2002	1	
1998	**2**	
1996	1	
1995	1	
1993	2	
1990	1	

Source: compiled by the author

Literature Table "The Impact of Community Entrepreneurship Education (Pkum) in the Context of Community Empowerment" 2015

Year of publication Citations	Number of citations of	Obsolescence
2012	1	Outdated literature on the Impact of Community Entrepreneurship Education (Pkum) in the Context of Community Empowerment in 2008
2008	**1**	
2004	1	

Source: compiled by the author

Literature Table "The Effect of Using Cooperative Learning Type Think-Pair-Share (Tps) on Entrepreneurship Learning Outcomes for Class X Students of Even

Semester Junior High School Kartikatama 1 Metro T.P 2015/2016"

Year of publication Citations	Number of citations of	Obsolescence
2014	1	Outdated literature on the influence of the use of cooperative learning type of think-pair-share (tps) on entrepreneurship learning outcomes of class X students of even semester SMA Kartikatama 1 Metro T.P 2015/2016 in 2011.
2011	1	
2009	1	
2003	1	

Source: compiled by the author

Literature Table "Factors Affecting Entrepreneurial Intentions" in 2016

Year of publication Citations	Number of citations of	Obsolescence
2013	2	Outdated literature on Factors Affecting Entrepreneurial Intentions in 2008.
2011	4	
2008	5	
2004	1	
1997	2	

Source: compiled by the author

Table Literature "Analysis and Proposed Marketing Strategy Using Swot Analysis Method (Case Study on Umkm Waringin Fish Feed Bandung)" 2017

Year of publication Citations	Number of citations of	Obsolescence
2016	2	Obsolete Literature From Analysis And Proposed Marketing Strategy With Swot Analysis Method (Case Study On Msme Waringin Bandung Fish Feed), 2011
2014	1	
2012	1	
2011	2	
2003	1	
2002	1	
1998	2	

Source: compiled by the author

Literature Table "Building Creative, Innovative and Beneficial Enterprises through the Application of Social Entrepreneurship" in 2017

Year of publication Citations	Number of citations of	Obsolescence
2012	1	Outdated literature on Building Creative, Innovative and Beneficial Enterprises through the Implementation of Social Entrepreneurship in 2008
2010	1	
2008	1	
1996	1	

Source: compiled by the author

Table Journal "Efect Of Entrepreneurship Education, Self Efficacy and Need For Achievement Toward Student's" in 2018

Year of publication Citations	Number of citations of	Obsolescence
2018	2	Limits of obsolescence Literature entitled Efect Of Entrepreneurship Education, Self Efficacy and Need For Achievement Toward Students from 2012.
2017	2	
2016	3	
2015	3	
2014	4	
2013	1	
2012	7	
2011	4	
2009	2	
2008	1	
2007	1	
2006	1	
2001	1	
1999	1	
1997	4	
1989	1	

Source: compiled by the author

Literature Table "Creative Economy Development in the Perspective of Economic Education" in 2018

Year of	Number of	Obsolescence

publication Citations	citations of	
2014	1	Outdated
2012	1	literature from
2010	1	Creative Economy
2009	**4**	Development in
2008	1	Economic
2004	1	Education
1999	1	Perspective in
1996	1	2009

Source: compiled by the author

Literature Table "The Impact of Trade Openness on Income Inequality in Indonesia" in 2019

Year of publication Citations	Number of citations of	Obsolescence
2010	2	Outdated
2008	1	literature starts
2006	1	from the Impact of
2004	**2**	Trade Openness on
2003	1	Income Inequality
1996	1	in Indonesia in
1985	1	2004
1980	1	

Source: compiled by the author

Literature Table "Smart Digital Marketing, Strategies to Target Millennial Indonesian Consumers" in 2019

Year of publication Citations	Number of citations of	Obsolescence
2016	1	Outdated
2014	2	literature from
2012	**1**	Smart Digital
2011	1	Marketing,
2010	1	Strategies to
2001	1	Target Indonesian
		Millennial
		Consumers in
		2009

Source: compiled by the author

From the table above we can see that the most obsolescence on the subject of

entrepreneurship was in 2008. The data on obsolescence of the literature was obtained from the number of articles published in that year, then added up all of them then divided in half to produce a median or middle value. The middle value is the limit of obsolescence of a literature.

$$\text{Median} = \frac{the\ number\ of\ articles\ produced\ in\ the\ journal}{2}$$

Author Productivity Level

In this article, the author uses 10 articles from 2015 to 2019 with 2 articles in each year. The author takes articles with the subject of Entrepreneurship to be researched. Then the author presents the number of articles in table form as follows:

Table of Sample Number of Articles with Entrepreneurship Subject

Number	Year Article	Number of Article
1	2015	2
2	2016	2
3	2017	2
4	2018	2
5	2019	2
Jumlah		10

Source: compiled by the author

The author productivity level is detailed to find out in more detail who is the most active in producing work in entrepreneurial journals by sorting them by year of publication from

2015 to 2019. Author names published are individual authors and collaborative authors whose names are named first in producing articles.

The level of author productivity in the Entrepreneurship journal from 2015 to 2019 is the result of processing the data for the author of the article in the journal. Based on the data, it can be seen that the most productive authors producing scientific articles during 2015 to 2019 are Wiliams, C, C with 4 articles.

The following is a list of writers' first to last ranking in producing scientific papers.

Author Productivity Level Table

Number	Rank	Author name	Number of articles produced
1	1	Williams, C, C	4
2	2	Muhammad Hassan	3
3	2	Berry, L	3
4	3	Bandura	2
5	3	I Ghozali	2
6	3	Michael Porter	2
7	3	Philip	2
8	3	P. Kraugman	2
9	3	Suharti	2
10	3	Kelley, S	2
11	3	Zain, D	2
12	3	Singh, Sangeeta	2
13	3	Parasuraman, A	2
14	3	Wafa, S.A	2
15	3	Hassan, R.A.	2
16	3	Suharti L	2
17	3	Indarti, N	2
18	4	Menguc, B	1
19	4	Allen, T. D	1
20	4	Boulding, W	1
21	4	Kalra, A	1
22	4	Staelin, R.	1
23	4	Zeithaml, V	1
24	4	Brown, S. P	1
25	4	Peterson, R. A	1
26	4	Castro, M	1
27	4	David M. R	1
28	4	Gwinner, K. P	1
29	4	Gremler, D	1
30	4	Bitner, M. J	1
31	4	Rush, M. C	1
32	4	Hoffman	1
33	4	McKenzie, S. B	1
34	4	Rina Suthia Hayu	1
35	4	hearne, M	1
36	4	Netemeyer, R.G	1
37	4	Boles, J.S	1
38	4	Mckee, D.O	1
39	4	McMurrian, R	1
40	4	Becker, T	1
41	4	Zeithaml, V	1
42	4	Rotundo, M	1
43	4	Sacket, P. R	1
44	4	E, Billings	1
45	4	Kirby, D. A	1
46	4	Mwasalwiba, E. S	1
47	4	Azwar B	1
48	4	Gorman, G	1
49	4	Hanlon, D	1
50	4	King, W	1
51	4	Gurbuz, G	1
52	4	Aykol, S	1
53	4	Hamidi, D.Y	1
54	4	Wennberg, K	1
55	4	Berglund, H	1
56	4	Eveleth, D. M	1
57	4	Gilbert, N. L	1
58	4	Hermina, U.N	1
59	4	Novieyana, S	1
60	4	Babin, B. J	1
61	4	Bell,S	1
62	4	Rostiani, R	1
63	4	Kourilsky, M.L	1
64	4	Walstad, W.B	1
65	4	Lee, S.H	1
66	4	Wong, P.K	1
67	4	Silvia	1
68	4	Anjali Midha	1
69	4	Hani S	1
70	4	Turker, D	1
71	4	Selcuk, S.S	1
72	4	Rintan Saragih	1
73	4	Noruzi, M.R,Westover	1
74	4	Gholam,R.R	1
75	4	Cunningham	1

76	4	Stuart D	1	129	4	McNally	1
77	4	Higgs	1	130	4	Kay, M.J	1
78	4	Peter L	1	131	4	Melati, I.S	1
79	4	Jack	1	132	4	Arief, S	1
80	4	Alistair R. Anderson	1	133	4	Baswara, S.Y	1
				134	4	Paco, A.M.F	1
81	4	Wood, M	1	135	4	Ferreira, J.M	1
82	4	W. McKinley	1	136	4	Raposo, M	1
83	4	Azis, M	1	137	4	Rodrigues, R.G	1
84	4	Haeruddin, M.I.M	1	138	4	Dinis, A	1
85	4	Azis, F	1	139	4	Paulina, I	1
86	4	Bhat, I.H	1	140	4	Wardoyo	1
87	4	Boles, J. S	1	141	4	Potishuk, V	1
88	4	Bayabashaija, W	1	142	4	Kratzer, J	1
89	4	Katono, I.	1	143	4	Baidi	1
90	4	Chen, C.C	1	144	4	Suyatno	1
91	4	Crick, A.	1	145	4	Fei, T.H.C	1
92	4	Greene, P.G	1	146	4	Rishipal	1
93	4	Denanyoh	1	147	4	Jain	1
94	4	Richard	1	148	4	Scanipello, K.F	1
95	4	Adjei, K	1	149	4	Souitaris V	1
96	4	Farouk, A	1	150	4	Zerbinati S	1
97	4	Ikram, A.	1	151	4	Al-Laham, A	1
98	4	Fulgence,	1	152	4	Naidoo, Vik	1
99	4	Ghina, A	1	153	4	Sirine, H	1
100	4	Simatupang, T.M	1	154	4	Sumarsono, H	1
101	4	Gustomo, A	1	155	4	Tong, X.F	1
102	4	Stephan Sonnenburg	1	156	4	Tong, D.Y.K	1
				157	4	Loy, L.C	1
103	4	Paul, P	1	158	4	Uddin, M.R	1
104	4	Hegarty, C.	1	159	4	Bose, T.K	1
105	4	Linda Hollebeek	1	160	4	Wahyu, A	1
106	4	Rostiani, N	1	161	4	Parimita, W	1
107	4	Jiying, W	1	162	4	Ayas T. Wigunaa	1
108	4	Zongabiro, P	1	163	4	Maddaremmeng A. Panennungia	1
109	4	Palagie, N	1				
110	4	Judge, T.A	1	164	4	De Vivo, G	1
111	4	Bono, J.E	1	165	4	Budden, C. B	1
112	4	Karimi, S	1	167	4	Anthony, J. F	1
113	4	Biemans, H.J	1	168	4	Budden, M. C	1
114	4	Lans, T	1	169	4	Jones, M. A	1
115	4	Chizari, M	1	170	4	Hargittai, E	1
116	4	Mulder, M	1	171	4	Holliman, Geraint	1
117	4	Khuong, M.N	1	172	4	Jennifer Rowley	1
118	4	Huu An, N	1	173	4	Nagy, Judit	1
119	4	Kolvereid, L	1				
120	4	Moen	1				
121	4	Kusmintarti, A	1				
122	4	Thoyib, A	1				
123	4	Maskie, G	1				
124	4	Ashar, K	1				
125	4	Lestari, R.B	1				
126	4	Wijaya, T	1				
127	4	Lopepihie, Z.A.	1				
128	4	Martin, B.C, J.J	1				

Source: compiled by the author

From the table above, we can see that the most productive author's entrepreneurship articles from 2015 to 2019 are Wiliam C, C who produced 4 articles. Then the second

rank is M. Hassan and Barry L who produced 3 articles. As well as several authors who produced 2 and 1 articles. The table above contains 173 authors who were measured individually to produce at least 1 to 7 articles during 2015 to 2019.

Table Containing Article Titles Produced by the First 3 Ranking Author.

No	Penulis	Judul Artikel
1	Williams, C,C	1. Entrepreneurship and the off-the-books economy: some lessons from England 2. The motives of off-the-books entrepreneurs: necessity- or opportunity-driven? 3. The hidden enterprise culture: entrepreneurs in the underground economy in England, Ukraine and Russia. 4. Spatial variations in the hidden enterprise culture: some lessons from England.
2	Muhammad Hassan	1. Karakteristik tenaga kerja industri kecil. 2. Produktivitas dan elastisitas kesempatan kerja sektor industri. 3. Pembinaan ekonomi kreatif Dalam perspektif pendidikan ekonomi
3	Berry, L	1. Pembinaan ekonomi kreatif Dalam perspektif pendidikan ekonomi 2. Refinement and reassessment of the SERVQUAL scale 3. Relationships marketing of services, growing interest, emerging perspectives.
4	Dst.....	

Source: compiled by the author

A. Percentage of Author Producing Articles

More than half of the authors produced only 1 article, namely 156 authors during 2015 to 2019. The percentage of the number of authors in producing scientific articles in Entrepreneurship journals during this period can be seen in the table below using the percentage formula :

$$P= f/N \times 100\%$$

Where : P= Presentase
f = Number of writer
N=number of all writer

Table of Percentage of Number of Author Producing Articles

Number of writer (f)	Number of articles produced	Presentase (P)
156	1	90%
14	2	8%
2	3	1,1%
1	4	0,9%
Jumlah (N)= 173		100%

Source: compiled by the author

Author Frequently Cited

The names that have been sorted in processing to determine the level of author productivity are used as a reference in identifying authors who are often cited by other authors in producing articles in each journal. Only individual authors and for collaborative authors use the normal account in which all authors are named in producing scientific articles that will be seen by other authors in their respective journals.

The names of the authors are frequently cited

among fellow authors on the subject of entrepreneurship from 2015 to 2019. The following is a table that shows the authors who are frequently cited in journals with the subject of Entrepreneurship.

Author's Frequently Cited Table

Number	The name of the cited author	Number of articles produced	The author's name is citing	Frequency	Number
1	Williams	4	-	-	-
2	Muhammad Hassan	3	-	-	-
3	Berry, L	3	-	-	-
4	Bandura	2	-	-	-
	I Ghozali	2	➢ Joko Suyono	1	3
			➢ Sinto Sunaryo	1	
			➢ Doddy Adhimursandi	1	
	Michael Porter	2	-	-	-
	Philip	2	-	-	-
	P. Kraugman	2	-	-	-
	Suharti	2	-	-	-
	Kelley, S	2	-	-	-
	Zain, D	2	-	-	-
	Singh, Sangeeta	2	➢ Baidi	1	3
			➢ Suyatno	1	
			➢ Rina Sutthia Hayu	1	
	Parasuraman, A	2	-	-	-
	Wafa, S.A	2	➢ Doddy Adhimursandi	1	3
			➢ Baidi	1	
			➢ Suyatno	1	
	Hassan, R.A.	2	-	-	-
	Suharti L		➢ Doddy Adhimursandi	1	
			➢ Baidi	1	
			➢ Suyatno	1	
	Indarti N		➢ Doddy Adhimursandi	1	
			➢ Baidi	1	
			➢ Suyatno	1	

Source: compiled by the author

From the table above it can be concluded that from the results of the calculation of the number of authors most frequently cited by other authors during the period of 5 years, namely from 2015 to 2019 are authors who produced 2 articles, namely I Ghozali, Singh,

Sangeeta, Wafa, SA and Suharti. L.

Testing Lotka's Law at the Productivity Level

The author has collected all articles of each journal from 2015 to 2019. From all the data collected, it can be seen how many articles are contained in journals with the subject of Entrepreneurship published in 2015-2019. So that the total number of authors is 173 authors.

Then the data that has been collected is tested using the inverse quadrad equation of Lotka's law, namely: $!. \, x! = c$. Where x is the number of articles written by individual authors, y is the number of authors who contribute x articles, and c is a constant. Calculating the distribution of productivity can be done after determining the values of the elements in the equation, namely the value of n and the value of c.

Calculation table to estimate Lotka's argument parameters

I	X	Y	X= log x	Y= log y	XY	X^2
1	4	1	0.6020	0.0000	0.0000	0.3624
2	3	2	0.4771	0.3010	0.1436	0.2276
3	2	14	0.3010	1.1461	0.3449	0.0906
4	1	156	0.0000	2.1931	0.0000	0.0000
Jumlah		173	1.3801	3.6402	0.4885	0.6806

Source: compiled by the author

In determining the value of n the following equation is used:

$$b = \frac{N \sum XY - \sum X \sum Y}{N \sum X^2 - (\sum X)^2}$$

$$b = \frac{4.0.4885 - (1.3801)(3.6402)}{4.0.6806 - 1.3801^2}$$

$$b = \frac{1.954 - 5.0238}{2.7224 - 1.9046}$$

$$b = \frac{-3.0698}{0.8178}$$

$$b = -3.7537$$

karena b= -*n, maka n* = 3.7537

Frequency Distribution Table With *n = 3.7537*

No	X	Y	X^n	$1/x^n$
1	1	156	1	1
2	2	14	13.4888	0.0741
3	3	2	61.7973	0.0161
4	4	1	181.9502	0.0549
Jumlah		173	258.2363	1.0956

Source: compiled by the author

Then to determine the value of c, it is determined using equations

$$C = \frac{1}{\sum \frac{1}{X^n}}$$

$$C = \frac{1}{1,0956}$$

$$C = 0.9127$$

From the above calculations, it has been found that many C values are 0.9127, which means that the number of authors with 1 article is a stipulation in a certain pattern, namely 0.9127 or 91.27%, then using these results the equation is as follows:

$$Y_x . \, X^{3.7537} = 0.9127$$

From the above equation, it can be seen that the author productivity frequency distribution results from the calculation of the author's productivity pattern using Lotka's Law, which can be seen in the following table:
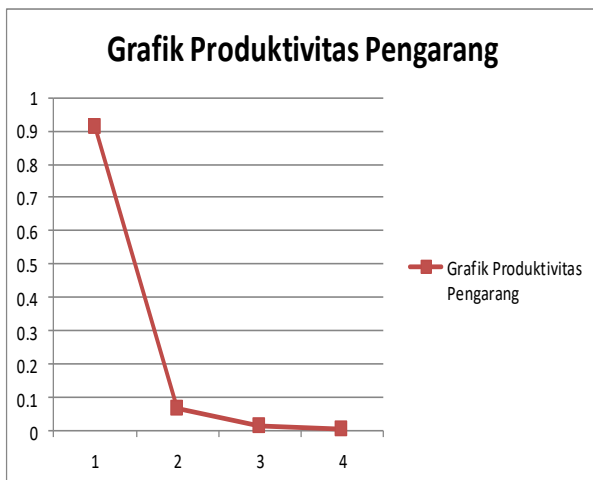
Author productivity patterns using Lotka's Law

$$Y_x \cdot X^{3.7537} = 0.9127$$

No	X	Y	$Y_x (c/x^n)$
1	1	156	0.9127
2	2	14	0.0676
3	3	2	0.0147
4	4	1	0.0050
	Jumlah	173	1

Source: compiled by the author

From the table above, a graph can be made as follows:

Author Productivity Graph

From the graph above, it can be seen that there is a relationship between the number of authors and the number of articles produced as in the lotka law. The fewer the number of writers, the more articles are produced.

CONCLUSIONS

Based on the results of data collection and data analysis in research that discusses obsolescence, writers are often cited and tested lotka law on author productivity in the 2015-2019 Entrepreneurship journal article. So the researchers drew several conclusions:

For journals on the subject of entrepreneurship in the 2015-2019 period. The level of obsolescence of his literature with an article entitled "The Effect of Organizational Citizenship Behavior on Performance with Service Quality, Satisfaction and Behavior Intention as Antecedents" with literature obsolescence and half-life of the last 17 years. And the shortest time for literature obsolescence is only 5 years, the article is entitled: "The Effect of Using Cooperative Learning Type Think-Pair-Share (Tps) on Entrepreneurship Learning Outcomes of Class X Students of Even Semester SMP Kartikatama 1 Metro T.P 2015/2016".

The results of the author's calculations are often cited in the 2015-2019 entrepreneurship articles by the authors who produced 2 articles, namely I Ghozali, Singh, Sangeeta, Wafa, S.A and Suharti L.

In this study, most of the authors produced one article in entrepreneurship journals in 2015-2019. The most productive writer produced 4 articles and got first place, namely Wiliams, then Muhammad Hassan and gave was in second place by producing 2 articles in the 2015-2019 period while the third rank was occupied by authors who produced 1 article in the 2015-2019 period, namely as many as 156 authors.

Based on the test of Lotka's law on entrepreneurship articles, it has an exponential value of (n) 3.7537, with the set (C) 0.9127 or 91.27%. From the graph, it can be seen that there is a relationship between the number of authors and the number of articles produced as in the lotka law. The fewer the number of writers, the more articles are produced.

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