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OBSOLESCENCE OF LITERATURE IN ZOOLOGY

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ABSTRACT

Obsolescence of literature helps the librarians to maintain the need-based collection of literature. The study attempts to examine the obsolescence of literature in zoology by citation analysis. Citations from 128 doctoral theses in zoology submitted to Sri Venkateswara University, Tirupati, India, during the period 1962-1994 forms the basis for the study. It is observed that the citation frequency follows a negative exponential pattern. Half-life of literature is found to be 13 years for journal citations and 13.27 years for book citations.

KEYWORDS: Zoology; Obsolescence; Half-life.

INTRODUCTION

Studies of aging or obsolescence of documents commonly assess the decline in the use of a representative set of documents over time. Such studies help the librarians in deciding which docu-ments are to be kept or discarded in order to maintain the need-based collection and manage the storage space problems in libraries. It is evident that some material in libraries becomes out of date as time progresses. This is known as "obsole-scence" of literature.

Obsolescence has been defined by Line and Sandison (1974) as the "decline overtime in validity of information". Obsolescence or aging is influenced by several factors such as the social status of the author(s), the reputation of the journal, the special form of communi-cation, etc. Even within the same subject field, these factors may cause significant deviations. Burton and Kebler (1960) introduced the term 'half-life' to quantitatively describe the rate of obsole-science of literature. Line (1970) defined half-life as "the time during which one-half of the currently active literature was published".

Several studies have been conducted on the obsolescence of literature in various subject fields. Some of the recent studies are; Gupta (1984) studied the obsole-scence factors and patterns in periodical literature of exploration geophysics, and determined that the half-life was 9.4 years. Sangam (1989) analysed the citations in doctoral theses in economics and found that the half-life of cited journals and books was 9.47 years and 15.7 years respectively. Gupta (1990) studied the obsolescence of

physics literature, and the density of citations to *Physical Review* articles was found to decrease exponentially with a half-life of 4.9 years. Mahendra and Deshmukh (1986) studied the obsolescence of libra-ry and information science literature based on the citations from articles published in *Annals of Library Science & Documentation* and found that the half-life was 8 and 12 years for journals and books respectively.

Citation analysis techniques are found to be very useful in the determination of obsolescence factors of literature of specific subject areas. The present study attempts to find out the obsolescence of literature in zoology by applying the citation analysis techniques.

OBJECTIVES OF THE STUDY

The specific objectives of the study are:
(i) to test the exponentiality of citation frequency and, (ii) to determine the half-life of journal citations and book citations separately.

METHODOLOGY

The doctoral theses accepted by Sri Venkateswara University, Tirupati, India, in the field of zoology, covering the period 1962-1994 were consulted for collecting the data required for the study. From a total of 128 theses, 21,669 journal citations and 3,219 book citations were noted down on slips and later were fed into the computer for analysis. Foxpro and the SPSS software packages were used for data entry and statistical analysis.

RESULTS AND DISCUSSION

Table 1 shows the age-wise distribution of citations (citation frequency) of journals and books in zoology. The table indicates that more than 27% of the journal citations are seven years or less in age. A total of 50% of citations are 12 years old or less. With regard to books, 27% of citations are less than 8 years in age. This shows that the researchers in zoology in Sri Venkateswara University use and refer to mostly recent literature.

Distribution pattern

The data in Table 1 is presented graphically in Figures 1 and 2 by taking age of citations on the X-axis and frequency of citations on the Y-axis. The cumulative percentage of citations are also shown in the same figures.

The data indicates a roughly declining trend in the frequency of citations as the cited literature ages. An initial build-up occurs from the first entry (t=0). The points are concentrated at one end and the curve tapers off gradually to zero at the other end.

It is observed from the graphs that the frequency polygons for both journals and books in zoology look like a negative exponential distribution. For such a distribution the variance and square of the mean are equal. The mean and variance calculated for the data given in Table 1 are as follows.

Journals	Books	15.00	125.77	15.30	
Mean	Variance	Mean	95.85		
Variance					

Table 1: Citation Frequency for Zoology

Journals				Books		
Age (t)		Number of Citations	Cumulative Percentage	Number of Citations	Cumulative Number	Percentage
> 1	132	132	0.61	13	13	0.40
1	368	500	2.30	65	78	2.42
2	642	1142	5.26	64	142	4.41
3	810	1952	9.00	98	240	7.46
4	989	2941	13.55	116	356	11.06
5	1052	3993	18.40	116	472	14.66
6	1006	4999	23.04	131	603	18.73
7	982	5981	27.56	135	738	22.93
8	1006	6987	32.20	154	892	27.71
9	1014	8001	36.87	148	1040	32.31
10	991	8992	41.44	129	1169	36.32
11	894	9886	45.56	124	1293	40.17
12	965	10851	50.01	144	1437	44.64
13	898	11749	54.15	138	1575	48.93
14	848	12597	58.05	129	1704	52.94
15	798	13395	61.73	121	1825	56.69
16	732	14127	65.10	115	1940	60.27
17	627	14754	67.99	137	2077	64.52
18	651	15405	70.99	106	2183	67.82
19	584	15989	73.69	107	2290	71.14
20	544	16533	76.19	95	2385	74.09
21	487	17020	78.44	81	2466	76.61
22	468	17488	80.59	84	2550	79.22
23	401	17889	82.44	81	2631	81.73
24	374	18263	84.17	67	2698	83.81
25	320	18583	85.64	57	2755	85.59
26	287	18870	86.96	56	2811	87.33
27	264	19134	88.18	59	2870	89.16
28	213	19347	89.16	40	2910	90.40
29	207	19554	90.11	36	2946	91.52
30	199	19753	91.03	39	2985	92.73
31	162	19915	91.78	30	3015	93.66
32	153	20068	92.48	26	3041	94.47

33	135	20203	93.11	31	3072	95.43
34	131	20334	93.71	25	3097	96.21
35	93	20427	94.14	16	3113	96.71
36	102	20529	94.61	15	3128	97.17
37	106	20635	95.10	8	3136	97.42

Table 1: (continued)

38	80	20715	95.47	11	3147	97.76
39	73	20788	95.80	8	3155	98.01
40	58	2084	96.07	9	3164	98.29
41	63	20909	96.36	3	3167	98.38
42	64	20973	96.65	10	3177	98.70
43	59	21032	96.93	1	3178	98.73
44	41	21073	97.12	1	3179	98.76
45	35	21108	97.28	2	3181	98.82
46	41	21149	97.47	1	3182	98.85
47	39	21188	97.65	8	3190	99.10
48	47	21235	97.86	2	3192	99.16
49	45	21280	98.07	2	3194	99.22
50	39	21319	98.25	2	3196	99.29
51	30	21349	98.39	1	3197	99.32
52	32	21381	98.53	1	3198	99.35
53	27	21408	98.66	1	3199	99.38
54	34	21442	98.82	3	3202	99.47
55	25	21467	98.93	0	3202	99.47
56	9	21476	98.97	3	3205	99.57
57	23	21499	99.08	1	3206	99.60
58	15	21514	99.15	1	3207	99.63
59	16	21530	99.22	1	3208	99.66
60	17	21547	99.30	0	3208	99.66
61	13	21560	99.36	1	3209	99.69
62	20	21580	99.45	3	3212	99.78
63	9	21589	99.49	0	3212	99.78
64	9	21598	99.53	1	3213	99.81
65	10	21608	99.58	0	3213	99.81
66	10	21618	99.63	0	3213	99.81
67	11	21629	99.68	1	3214	99.84
68	5	21634	99.70	0	3214	99.84
69	3	21637	99.71	0	3214	99.84
70	7	21644	99.75	0	3214	99.84
71	4	21648	99.76	0	3214	99.84
72	9	21657	99.81	0	3214	99.84
73	5	21662	99.83	1	3215	99.88
74	3	21665	99.84	0	3215	99.88
75	1	21666	99.85	1	3216	99.91
76	33	21699	100.00	3	3219	100.00

Figure 1: Citation Frequency for Zoology (Journals)

AGE OF CITATIONS (t) ___ CUM. FREQ. CURVE ___ FREQ. POLYGON

Figure 2: Citation Frequency for Zoology (Books)

AGE OF CITATIONS (t) ___ CUM. FREQ. CURVE ___ FREQ. POLYGON

The Kolmogorov-Smirnov (K-S) (Gillet, 1994) test is used to test the exponen-tiality of the distribution. The observed (F(x)) and estimated (E(x)) cumulative percentages and the absolute differences between the observed and estimated cu-mulative percentages [Dn = |F(x) - E(x)|] are calculated and are shown in Table 2. Under the assumption that the data follows a negative exponential distribu-

Table 2: Citation Data for Zoology and Observed and Estimated Cumulative Percentages

	Journals				Books			
Age in years (x)	No.of citations f (x)	Obser-ved cum. % F (x)	Esti-mated cum. % E (x)	D	No. of citations f (x)	Obser-ved cum. F (x)	Estima-ted cum. % E (x)	D
0	132	0.0061	0.0000	0.0061	132	0.0061	0.0000	0.0061
1	368	0.0231	0.0645	0.0414	368	0.0231	0.0645	0.0414
2	642	0.0527	0.1248	0.0721	642	0.0527	0.1248	0.0721
3	810	0.0901	0.1812	0.0911	810	0.0901	0.1812	0.0911
4	989	0.1357	0.2340	0.0983	989	0.1357	0.2340	0.0983
5	1052	0.1843	0.2834	0.0991	1052	0.1843	0.2834	0.991
6	1006	0.2307	0.3296	0.0989	1006	0.2307	0.3296	0.0989
7	982	0.2761	0.3728	0.0967	982	0.2761	0.3728	0.0967
8	1006	0.3225	0.4133	0.0908	1006	0.3225	0.4133	0.0908
9	1014	0.3693	0.4511	0.0818	1014	0.3693	0.4511	0.0818
10	991	0.4150	0.4865	0.0715	991	0.4150	0.4865	0.0715
11	894	0.4563	0.5196	0.0633	894	0.4563	0.5196	0.0633
12	965	0.5008	0.5506	0.0498	965	0.5008	0.5506	0.0498
13	898	0.5423	0.5796	0.0373	898	0.5423	0.5796	0.0373
14	848	0.5814	0.6067	0.0253	848	0.5814	0.6067	0.0253
15	798	0.6182	0.6320	0.0138	798	0.6182	0.6320	0.0138
16	732	0.6520	0.6558	0.0038	732	0.6520	0.6558	0.0038
17	627	0.6810	0.6779	0.0031	627	0.6810	0.6779	0.0031
18	651	0.7110	0.6987	0.0123	651	0.7110	0.6987	0.0123
19	584	0.7380	0.7181	0.0199	584	0.7380	0.7181	0.0199
20	544	0.7631	0.7363	0.0268	544	0.7631	0.7363	0.0268
21	487	0.7856	0.7533	0.0323	487	0.7856	0.7533	0.0323
22	468	0.8072	0.7692	0.0380	468	0.8072	0.7692	0.0380
23	401	0.8257	0.7841	0.0416	401	0.8257	0.7841	0.0416

24	374	0.8429	0.7980	0.0449	374	0.8429	0.7980	0.0449
25	320	0.8577	0.8110	0.0467	320	0.8577	0.8110	0.0467
26	287	0.8709	0.8232	0.0477	287	0.8709	0.8232	0.0477
27	264	0.8831	0.8346	0.0485	264	0.8831	0.8346	0.04885
28	213	0.8930	0.8453	0.0477	213	0.8930	0.8453	0.0477
29	207	0.9025	0.8553	0.0472	207	0.9025	0.8553	0.0472
30	199	0.9117	0.8646	0.0471	199	0.9117	0.8646	0.0471

Table 2: (Contd)

31	162	0.9192	0.8733	0.0459	162	0.9192	0.8733	0.04559
32	153	0.9262	0.8815	0.0447	153	0.9262	0.8815	0.0447
33	135	0.9325	0.8891	0.0434	135	0.9325	0.8891	0.0434
34	131	0.9385	0.8963	0.0422	131	0.9385	0.8963	0.0422
35	93	0.9428	0.9030	0.0398	93	0.9428	0.9030	0.0398
36	102	0.9475	0.9092	0.0383	102	0.9475	0.9092	0.0383
37	106	0.9524	0.9151	0.0373	106	0.9524	0.9151	0.0373
38	80	0.9561	0.9206	0.0355	80	0.9561	0.9206	0.0355
39	73	0.9595	0.9257	0.0338	73	0.9595	0.9257	0.0338
40	58	0.9622	0.9305	0.0317	58	0.9622	0.9305	0.0317
41	63	0.9651	0.9350	0.0301	63	0.9651	0.9350	0.0301
42	64	0.9680	0.9391	0.0289	64	0.9680	0.9391	0.0289
43	59	0.9707	0.9431	0.0276	59	0.9707	0.9431	0.0276
44	41	0.9726	0.9467	0.0259	41	0.9726	0.9467	0.0259
45	35	0.9742	0.9502	0.0240	35	0.9742	0.9502	0.0240
46	41	0.9761	0.9534	0.0227	41	0.9761	0.9534	0.0227
47	39	0.9779	0.9564	0.0215	39	0.9779	0.9564	0.0215
48	47	0.9801	0.9592	0.0209	47	0.9801	0.9592	0.0209
49	45	0.9822	0.9618	0.0204	45	0.9822	0.9618	0.0204
50	39	0.9840	0.9643	0.0197	39	0.9840	0.9643	0.0197
51	30	0.9854	0.9666	0.0188	30	0.9854	0.9666	0.0188
52	32	0.9868	0.9688	0.0180	32	0.9868	0.9688	0.0180
53	27	0.9881	0.9708	0.0173	27	0.9881	0.9708	0.0173
54	34	0.9897	0.9744	0.0164	25	0.9908	0.9744	0.0164
55	25	0.9908	0.9744	0.0164	25	0.9908	0.9744	0.0164
56	9	0.9912	0.9761	0.0151	9	0.9912	0.9761	0.0151
57	23	0.9923	0.9776	0.0147	23	0.9923	0.9776	0.0147
58	15	0.9930	0.9791	0.0139	15	0.9930	0.9791	0.0139
59	16	0.9937	0.9804	0.0133	16	0.9937	0.9804	0.0133
60	17	0.9945	0.9817	0.0128	17	0.9945	0.9817	0.0128
61	13	0.9951	0.9828	0.0123	13	0.9951	0.9828	0.0123
62	20	0.9960	0.9840	0.0120	20	0.9960	0.9840	0.0120
63	9	0.9964	0.9850	0.0114	9	0.9964	0.9850	0.0114
64	9	0.9969	0.9860	0.0109	9	0.9969	0.9860	0.0109
65	10	0.9973	0.9869	0.0104	10	0.9973	0.9869	0.0104
66	10	0.9978	0.9877	0.0101	10	0.9978	0.9877	0.0101
67	11	0.9983	0.9885	0.0098	11	0.9983	0.9885	0.0098
68	5	0.9985	0.9892	0.0093	5	0.9985	0.9892	0.0093

69	3	0.9987	0.9899	0.0088	3	0.9987	0.9899	0.0088
70	7	0.9990	0.9906	0.0084	7	0.9990	0.9906	0.0084
71	4	0.9992	0.9912	0.0080	4	0.9992	0.9912	0.0080
72	9	0.9996	0.9918	0.0078	9	0.9996	0.9918	0.0078
73	5	0.9998	0.9923	0.0075	5	0.9998	0.9923	0.0075
74	3	1.0000	0.9928	0.0072	3	1.0000	0.9928	0.0072
75	1	1.0000	0.9933	0.0067	1	1.0000	0.9933	0.0067

tion, the estimated cumulative percen-tages are calculated using the following formula of exponential distribution:

$E(x) = 1 - e^{dx}$ where d = 1/mean and x = 0,1,2 .....n.

At 0.01 level of significance the K-S statistics (the critical value of D) is equal to 1.63/ /n. In this case the value of n=75 and hence the critical value of D is 0.1882. On examining the value of D in Table 2, it is observed that the maximum value of D does not exceed this critical value (0.1882) and hence it conforms statistically that the age distribution of citations in both the bibliographic forms viz., journals and books follow a nega-tive exponential distribution.

Half-life Period

Based on the graphs shown in Figures 1 and 2, the half-life of journals and books in zoology is calculated. A line parallel to the X-axis is drawn from a point, say A on the Y-axis representing the half of the citations (i.e.50%) to meet the curve say at B. Then a perpendicular to X - axis (BC) is drawn from point B to meet the X - axis at C. C represents the half-life period for citations. From the figures it is observed that the half-life period is 12 years and 13.27 years for journal citations and book citations respectively.

CONCLUSIONS

The following general conclusion can be drawn from the results of this study. The half-life of cited journals and books is 12 years and 13.27 years respectively. The citation frequency distribution follows a negative exponential pattern, which has been proven statistically by applying K-S test.

The results of the study would be useful to the librarians and information scien-tists for planning, managing the informa-tion resources and services in the field of zoology.

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