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Research Trend Analysis of Vidyasagar University since 1989: A Bibliometric Study

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Abstract

The present paper attempts to analyze quantitatively the growth of research output in Vidyasagar University in terms of publication output as reflected in web of science database over the years 1989 to 2014. The data was collected from the web of science database. The analysis highlights yearly output of research publications, publishing trend, authorship pattern, funding agencies, collaborating organizations, collaborating countries, most productive authors of the University, most preferred journals for publication, citation profile of the contributed papers and the top cited papers and authors of the University. It is observed that the analyzed results tally well with Bradford's distribution for bibliographic scattering and Lotka's law of author productivity.

Keywords: *Vidyasagar University, bibliometric analysis, research trend analysis, Bradford's law, Lotka's law, University of Trieste, IIT*

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INTRODUCTION

Trend analysis indicates outlining a pattern by the collected information about any topic. This term is frequently used to predict future events. It could also be used to estimate uncertain events in the past, such as how many ancient rulers or kings ruled between two dates, based on data such as the average years which other known kings reigned. Research is a function that includes creative or innovative task undertaken on a systematic basis in order to improve the knowledge base, including human knowledge, culture and society, and the use of knowledge to devise new applications.

Research has manifold objectives, viz. to establish or confirm facts; to reaffirm the results of previous works; to solve new or existing problems; to support theorems or to develop new theories and so on. A research project may also be an extension of a retrospective problem in the field concerned. The primary objectives of basic research include functions like documentation, discovery, interpretation and explanation in a new way, developing new view point etc. for the progress of human knowledge. Approaches to research vary considerably both within and between different broad disciplines like science, technology, humanities and social sciences. Research trend analysis of a subject, scientist or institution is a classical area of study touching numbers of disciplines. Research projects undertaken by different universities and institutions are the fastest ways for the government to move the nation towards the knowledge-based economic country. Bibliometric analysis is an effective way of quantitative study of research trend. It basically deals with scattering of different objects over its creators or containers. For instance, scattering of published articles over journals or scattering of published articles by the contributing authors etc. Bibliometric analysis reveals the core journals and core authors in any particular subject or institution. This paper carried out bibliometric study of research trend of Vidyasagar University situated in Midnapore town of West Bengal.

VIDYASAGAR UNIVERSITY: BRIEF HISTORY [1]

Vidyasagar University, named after one of the most illustrious sons of Bengal as well as one of the doyens of Indian Renaissance, Pandit Iswar Chandra Vidyasagar (1820–1891), has grown out of a long cultural and educational movement in West Bengal in general and in

the undivided district of Midnapore in particular. The idea of founding a University in the district was mooted by the various organizations, notably by the regional education association, Midnapore, headed by Professor A.K. Gayen of IIT, Kharagpur. The Vidyasagar University act was passed in the assembly of West Bengal in 1981 and Professor Bhupesh Chandra Mukherjee joined as the first vice chancellor of the University on 29th September 1981. Academic activities were started since 1985, when 30 colleges of the district of Midnapore were affiliated to the Vidyasagar University with effect from 1st June 1985. The first research outcome of this University was published in 1989 as indexed in web of science database.

The contributors of the foremost university research publications came from the then faculty member of the department of applied mathematics with oceanology and computer programming, Prof. Bijan Bagchi, and his research associates, i.e. Dr. Anuradha Lahiri, Dr. Prodyot Kr. Roy, Dr. A Mitra and Dr. S Niyogi. The bibliographic details of the first four university research publications of 1989 are furnished below. The numbers of citations received by the papers are obtained from Google Scholar database:

- Bagchi Bijan, Anuradha Lahiri, Prodyot Kumar Roy. Conservation Laws, Korteweg–de Vries and Sine-Gordon Systems, and the Role of Super Symmetry. *Phys Rev D*. 1989; 39(4): 1186. (Cited by 13).
- Mitra A, *et al*. Nonuniqueness of the Factorization Scheme in Quantum Mechanics. *Int J Theor Phys*. 1989; 28(8): 911–916p. (Cited by 6).
- Bagchi B, Lahiri A, Niyogi S. Electromagnetic Charge Radii of Pseudoscalar Mesons. *Phys Rev D*. 1989; 39(11): 3384. (Cited by 2).
- Lahiri Anuradha, Prodyot Kumar Roy, Bijan Bagchi. Supersymmetry and the Ladder Operator Technique in Quantum Mechanics: The Radial Schrödinger Equation. *Int J Theor Phys*. 1989; 28(2): 183–189p.

Classes were started in six post graduate departments of the university, viz. anthropology, applied mathematics with oceanology and computer programming, commerce with farm management, economics with rural development, library and information science and political science with rural administration. The university presently houses twenty-seven postgraduate departments, including twelve humanities and social sciences and 15 science departments. There are forty-six undergraduate colleges affiliated under this University. The University was accredited as B (CGPA: 2.86) by national assessment & accreditation council (NAAC) in 2014.

REVIEW OF LITERATURE

Gupta examined Indian research activities in Medicine through analysis of 65,745 papers published during 1999–2008 as indexed in Scopus database [2]. Mishra *et al*. examined the bibliometric data from the number of publication of IMS and SUM hospital, Bhubaneswar (207 papers) during 2009 to 2013 to assess research productivity and impact [3]. Gupta examined research output of four south Asia countries, viz. Pakistan, Bangladesh, Sri Lanka and Nepal in S&T during 2001–2010 as indexed in Scopus database [4]. Aswathy examined the publication pattern of faculty members of three universities in Kerala i.e. university of Kerala, Mahatama Gandhi university and university of Calicut [5]. Sevukan analyzed research output in plant sciences of the faculties in central universities of India [6].

Thirumagal examined scientific publications generated by the Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu over a period of 1992 to 2011 covered in the web of science database [7]. Nagarkar examined the research contributions made by the faculty members of the department of chemistry at university of Pune [8]. Kumbar examined the growth, contribution and impact of research carried out by the scientists of university of Mysore in science and technology [9]. Gupta examined a total of 50 Indian universities with comparatively high output of publication during ten year period from 1999 to 2008 as indexed in Scopus database [10]. Majhi examined the quantitative growth and development of physical science research in Sambalpur university in terms of publication as indexed in Scopus database over the period

1971 to 2010 [11]. Siwach examined research contributions of Maharshi Dayanand University [12]. Rautaray *et al*. examined the research productivity of KIIT University, Odisha, and analyzed 361 papers indexed in Scopus database from the year 2000 to 2013 [13]. Kumar *et al*. examined the research publications of Gujarat university during the ten-year period, i.e. since 2004 to 2013 [14].

The study included a total of 760 papers as indexed in Scopus database. Nandi examined 141 theses submitted from Chemistry department of the university of Burdwan during 1960–2000 [15]. Baskaran examined research contribution of Alagappa University during 1999–2011 [16]. Gautam examined research publications of Banaras Hindu university, Varanasi, India [17]. A total of 1041 articles were collected from Indian citation index for the period of 2004–2013. Nagarkar examined research productivity of life sciences faculty members at the Savitribai Phule Pune University (SPPU), Maharashtra, India, over the period of 15 years (1999–2013) as indexed in web of science database [18]. Gopikuttan examined the research productivity of university of Kerala based on the data collected from web of science over a period of thirteen years from 2000 to 2012 [19].

Jeyshankar examined bibliographical details of 1282 research articles published by the scientists of CERI over the period of 2000–2009 [20]. Gupta examined the research trend of Karnatak university in terms of its research output during 1999–2008 including the number of papers published annually, its growth rate, international collaborative publication share and major collaborative partner countries, citation quality and impact of publications [21]. Maharana examined the growth, contribution, and impact of research carried out by the researchers at the Orissa university of agricultural technology, Bhubaneswar, based on the publications indexed in Scopus during 2008 to 2012 [22]. Gupta examined research output of computer science, in 11 sub-fields, in India during 1999–2008 [23]. This study is based on the Indian publication data in computer science retrieved from the Scopus citation database for 10 years (1999–2008). Vasishta examined research publications of PEC during 1996–2009, its growth, format, media of communication, national and international collaboration profile and overall citation impact, distribution of research output and impact under broad subjects and under different subject departments [24]. Beck examined the standard of research at different departments of the faculty of natural sciences of Kossuth Lajos university [25].

Vanchinathan examined the mapping of research productivity in Bharathidasan university and Madurai Kamaraj university from 2009 to 2013 as indexed Indian citation index [26]. Singh carried out research trend analysis of Indian Institute of Technology, Ropar [27]. Visakhi studied research trend of faculty and scholars of Indian Institute of Science, education and research, Mohali [28]. Dutta carried out scientometric study of carbon nanotube research and cosmology research in India [29, 30].

OBJECTIVES

The main objectives of this study are:

1. To examine the authorship pattern of the research communication;
2. To find out the document types of the research publications;
3. To find out major journals used for communication;
4. To study the citations received by the papers and to identify the highly cited papers;
5. To identify the most prolific authors of the university;
6. To analyse the year-wise research productivity and growth of VU publications;
7. To examine the national and international collaborations of VU; and
8. To identify the top funding agencies which provided research grants.

METHODOLOGY APPLIED AND LIMITATIONS OF STUDY

The study aims to evaluate the research publications of Vidyasagar university. To assess the research outputs of Vidyasagar University, it's publications over 26 years since 1989 to 2014 were considered for the study. The study is based on the data retrieved

from web of science (WOS) database; an online bibliographic database provided by Thomson Reuters Inc., Philadelphia, USA subscribed by Vidyasagar university through UGC-INFONET consortium. The query used for the collection of data was (Address= Vidyasagar University Time Period=1989–2014). The data was collected on 4th November 2015.

The results obtained were recorded in MS Excel and refined to obtain relevant data regarding authors, organizations, funding agencies, source journals, etc. Only articles including review articles, letters, meeting abstracts, notes *et al.* have been considered within the scope of this study. The papers published in conference, seminar or symposium proceedings are not considered here. It has been observed, that out of 986 publications, journal articles amount to 942 (95.5 %), review papers amount to 13 (1.3 %) and letters amount to 11 (1.1%). Other forms of research outcomes included meeting abstracts (7), note papers (6), correction papers (4) and book review (1).

DATA ANALYSIS AND DISCUSSIONS

Growth of Literature

The VU has published 986 papers over the span of 26 years since 1989 to 2014, i.e. 38 papers per year on average. A steep rise in the number of publications is observed from 2008 onwards. In the year 1989 the university published only four papers while in 2013 it published 129 papers, highest among all the years (Table 1) followed by 119 papers published in the next year, i.e. 2014. The lowest number of papers was published in 1995 (only two) (Table 1). The papers published during last 5 years from 2010 to 2014 accounts for more than half of the papers published during 1989–2014. The 986 papers published by the university during 1989–14 received 8188 citations with an average citation per paper (ACPP) of 8.3 (Table 1). As the first research output has been so far observed in 1989, the academic age of the university in that year is reckoned as one.

The variation of number of papers over entire time span is presented in Figure 1. The variation pattern of growth of university research output with the academic age of the university is presented in Figure 2. The variation of ACPP over the said time span is presented in Figure 3. The highest ACPP was observed in 2000 (25.33) followed by that in just next year 2001 (24.88). The lowest ACPP is observed in 2014 (1.73).

The nature of variation of research growth pattern with the university's academic age (Figure 2) fits best logistic growth model as determined by the method of least squares with the following generalised form of equation. The software used for this purpose is FindGraph, which is a curve-fitting software.

$y=ax^n/(b+x^n)=a/(1+bx^(–n))$,

Where a, b and n are constants. The university's academic age is the independent variable and is plotted along the X-axis, while the number of publications is the dependent variable and is plotted along the Y-axis. The mean graph is plotted against the collected data. The values of the constants for this set of data are: a=28.1; b=–32.1 and n=1.025.

Table 1: *Year-Wise Distribution of Number of Papers.*

Year	Academic Age	No. & % of Total Publications	Average Citations Per Paper (ACCP)
1989	1	4 (0.4)	4.25
1990	2	4 (0.4)	13
1991	3	3 (0.3)	5
1992	4	8 (0.8)	8.63
1993	5	12 (1.2)	8.75
1994	6	6 (0.6)	1.83
1995	7	2 (0.2)	16.5

1996	8	3 (0.3)	9.33
1997	9	12 (1.2)	10.25
1998	10	16 (1.6)	10.63
1999	11	17 (1.7)	4.47
2000	12	12 (1.2)	25.33
2001	13	17 (1.7)	24.88
2002	14	15 (1.5)	18.93
2003	15	25 (2.5)	11.84
2004	16	27 (2.7)	17.48
2005	17	33 (3.3)	14.97
2006	18	57 (5.8)	11.56
2007	19	68 (6.9)	9.38
2008	20	66 (6.7)	9.56
2009	21	97 (9.8)	11.1
2010	22	63 (6.4)	7.44
2011	23	74 (7.5)	5.96
2012	24	97 (9.8)	6.45
2013	25	129 (13.1)	3.65
2014	26	119 (12.1)	1.73
Total		986	8.3

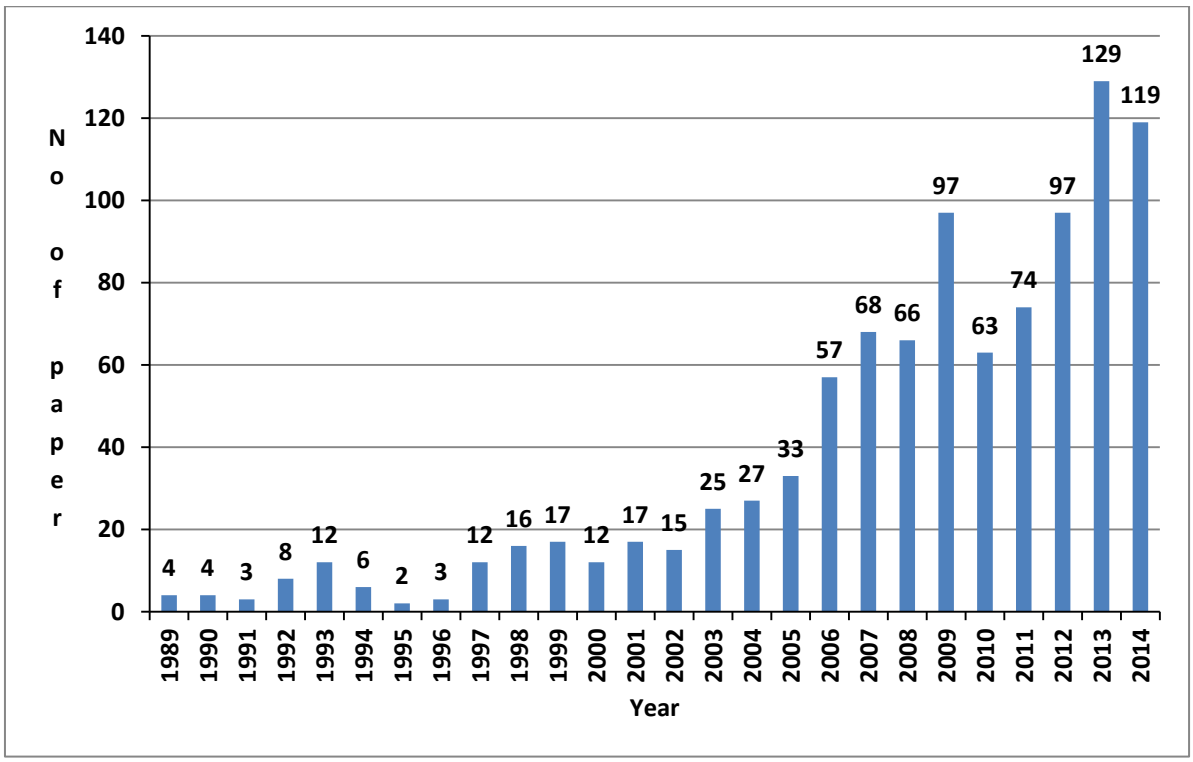

Fig. 1: *Number of Papers Since 1989 to 2014.*

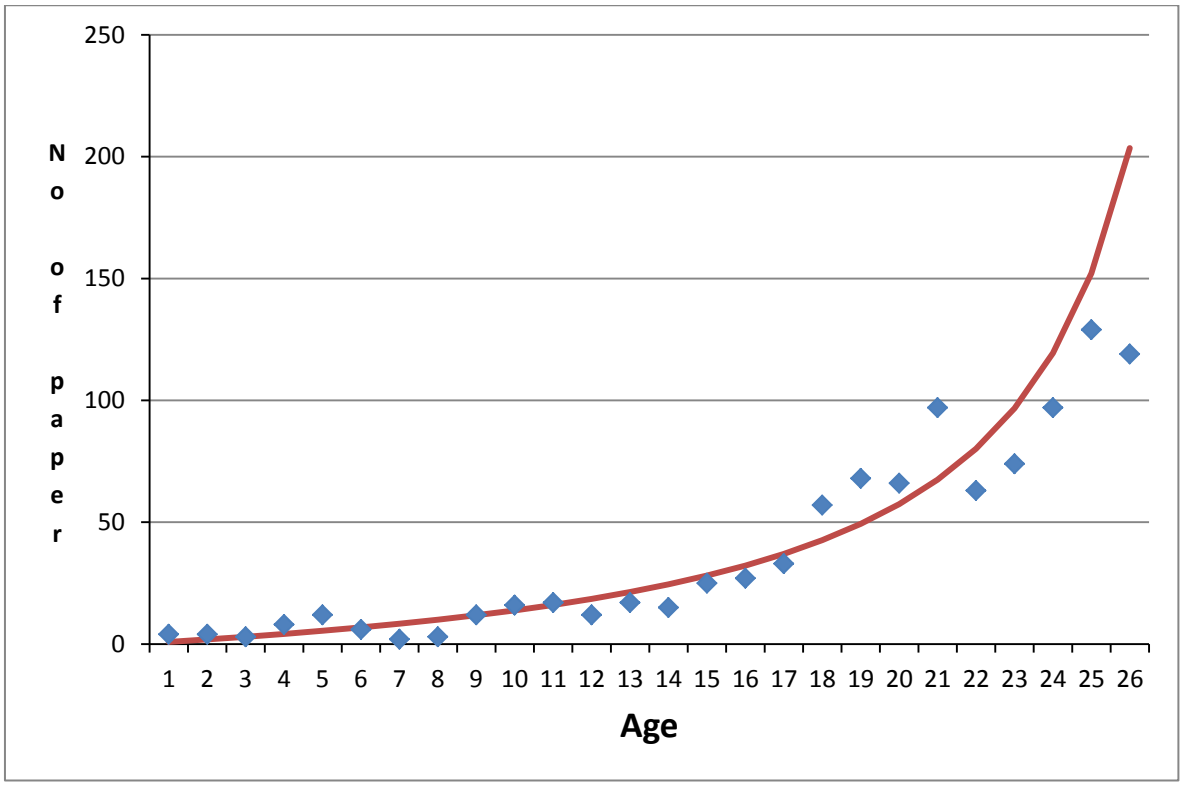

Fig. 2: *Variation of the Number of Papers with the Age of the University.*

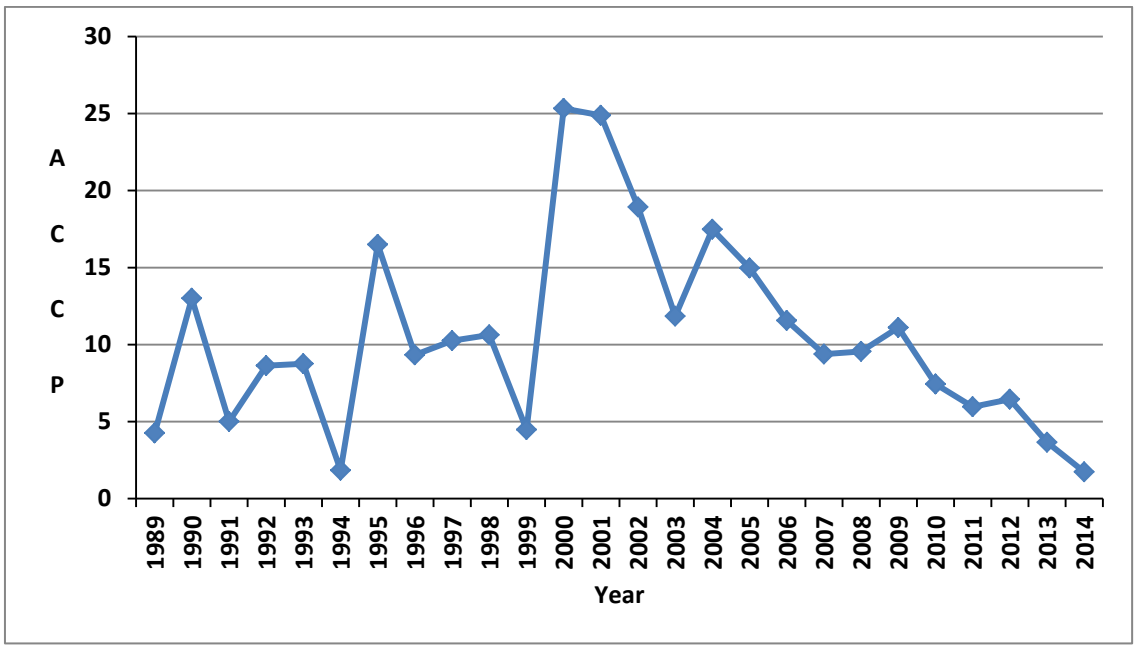

Fig. 3: *ACPP since 1989 to 2014.*

Authorship Pattern

The authorship pattern of the contributed papers of VU shows dominance of papers contributed by three authors (27.3%) followed by two-authored papers (18.4%) and four-authored papers (18%) (Table 2). The percentage of single-authored paper is very low, only 3.3%. This pattern reveals prevalence of small-sized team research with two, three or four members. The tendency of solo-research is almost negligible. The potential authors of the university belong to the departments of anthropology, applied mathematics with oceanology & computer programming, botany and forestry, chemistry & chemical technology, human physiology

with community health, microbiology and physics & technophysics (Table 3). The topmost contributing author is Syed Sirajul Islam (89 papers) followed by Manoranjan Maiti (88 papers), Bikas R Pati (68 papers), Keshab C Mondal (60 papers) and Somnath Roy (58 papers) (Table 3).

Table 2: *Distribution of Authorship Pattern over All Literature.*

Number of Authors	Authorship	Frequency & % of Publications
1	Single-authored	33 (3.3%)
2	2-authored	181 (18.4)
3	3-authored	269 (27.3)
4	4-authored	177 (18.0)
5	5-authored	115 (11.7)
6	6-authored	59 (6.0)
7	7-authored	71 (7.2)
8	8-authored	32 (3.2)
9	9-authored	31 (3.1)
10	10-authored	10 (1.0)
11	11-authored	1 (0.1)
12	12-authored	3 (0.3)
13	13-authored	5 (0.5)

Table 3: *Top Fourteen Contributing Authors with More than Thirty Contributions Each.*

Authors' Name	Departments	No. & % of Articles Contributed
Syed Sirajul Islam	Chemistry and Chemical Technology	89 (9.0)
Manoranjan Maiti	Applied Mathematics with Oceanology and Computer Programming	88 (8.9)
Bikas R. Pati	Botany and Forestry	68 (6.9)
Keshab C Mondal	Botany and Forestry	60 (6.1)
Somenath Roy	Human Physiology with Community Health	58 (5.9)
Prasanta K Mahapatra	Physics and Technophysics	56 (5.7)
Soumitra Mondal	Chemistry and Chemical Technology	54 (5.5)
Debidas Ghosh	Human Physiology with Community Health	54 (5.5)
Kaushik Bose	Anthropology	48 (4.9)
Subhasis Das	Human Physiology with Community Health	46 (4.7)
Sudipta Dalai	Chemistry and Chemical Technology	43 (4.4)
Debsankar Das	Chemistry and Chemical Technology	41 (4.2)
Pradeep Kumar Das Mahapatra	Microbiology	38 (3.9)
Ajay Mishra	Chemistry and Chemical Technology	33 (3.3)

Table 4: *Top Five Funding Agencies.*

Name of Agencies	No. of Papers Sponsored
University Grant Commission (UGC)	167
Council of Scientific and Industrial Research (CSIR)	132
Department of Science and Technology (DST)	105
Department of Biotechnology (DBT)	20
Indian Council of Medical Research (ICMR)	8

Funding Agencies

The major research funding agencies are enumerated in Table 4, which shows maximum number of funding came from UGC followed by CSIR, DST, DBT and ICMR.

Research Collaboration

The authors affiliated to VU have collaborated with authors of other institutes of India and abroad. The list of top institutions collaborating with VU (having at least 10 collaborative papers) is shown in Table 5. At the national level, VU has the highest number of collaborative papers with all IITs (other than Kharagpur, 126 papers), which is followed by university of Calcutta (58 papers), Bose institute (33 papers) and Indian association for the cultivation of sciences (29 papers). At international level, VU has the highest number of collaborative papers with university of Trieste, Italy (23 papers). The authors affiliated to VU collaborated with authors from different countries (Table 6). Amongst the collaborating countries, USA tops the list (27 papers) followed by Italy (24 papers), England (10 papers) and South Korea (8 papers). The collaboration with USA and European countries are stronger compared to Asian and SAARC countries. The university has collaboration with only three SAARC countries, i.e. Bangladesh, Pakistan and Nepal (one paper each). The university also collaborated with three BRICS countries, i.e. Brazil, China and South Africa.

Table 5: *Top Institutions Collaborating with VU (1989–2014).*

Rank	Affiliation	Country	No. of Papers (Each)
1	Indian Institute of Technology (Other than Kharagpur)	India	126
2	University of Calcutta	India	58
3	Bose Institute, Kolkata	India	33
4	Indian Association for the Cultivation of Sciences, Kolkata	India	29
5	University of Trieste	Italy	23
6	Mahishadal Raj College; Raja N L Khan Women's College, Midnapore; University of Burdwan	India	22
7	Midnapore College	India	18
8	Indian Institute of Technology, Kharagpur; National Institute of Technology; Panskura Banamali College	India	17
9	Haldia Institute of Technology; Jadavpur University, Kolkata	India	16
10	Jagannath Kishore College, Purulia	India	15
11	Electrocom Techology India LTD. Ahmedabad; Narajole Raj College, Midnapore; Prabhat Kumar College, Contai	India	10

Table 6: *List of Collaborating Countries.*

Rank	Collaborating Countries	No. of Contributions (Each)
1	USA	27
2	Italy	24
3	England	10
4	South Korea	8
5	Spain, Portugal, Poland, Mexico	4
6	Chile, Ireland	3
7	Turkey, Taiwan, Switzerland, Japan, Czech Republic, Canada, Belgium	2
8	South Africa, Singapore, Romania, Peoples R China, Pakistan, Netherlands, Nepal, Malaysia, Indonesia, Germany, France, Brazil, Bangladesh, Austria, Australia	1

Scattering of Papers over Journals and Bradford's Law

The authors affiliated to VU published 986 papers in 416 journals. The scattering of papers over journals has been studied by using Bradford's law of bibliographic scattering. The Bradford's distribution is used for identifying the 'core' journals. Core journals are central to a subject because they mainly produce a subject's maximum probable content. Figure 4 shows Bradford plot, where cumulative number of papers is plotted against the journal's rank. The segmentation of 986 papers in three equal zones retaining 329 papers in each zone that instantly reveals the following Bradford's ratio of number of journals in each zone as follows:

$30:98:288=30*(1:3.3:9.6)\sim30*[1:3:(3)^2]$

This ratio tallies with Bradford's pattern $[k*(1:n:n^2)]$ with the value of the Bradford's multiplier (k) as 30 and the value of 'n' is 3 (Table 7).

Table 7: *List of Journals with More than Ten Publications Each.*

Rank	Journals	No. & % Of Articles Published Therein
1	Carbohydrate Research	55 (5.6)
2	Applied Mathematical Modeling	19 (1.9)
3	Carbohydrate Polymers	16 (1.6)
4	Applied Mathematics and Computation	14 (1.4)
5	Optical Engineering	13 (1.3)
6	European Journal of Operational Research, International Journal of Computer Mathematics, Journal of Applied Physics, Journal of Molecular Structure Theochem	11 (1.1)
7	5 journals published 9 papers each	
8	5 journals published 8 papers each	
9	5 journals published 7 papers each	
10	8 journals published 6 papers each	
11	11 journals published 5 papers each	
12	26 journals published 4 papers each	
13	31 journals published 3 papers each	
14	72 journals published 2 papers each	
15	241 journals published 1 papers each	

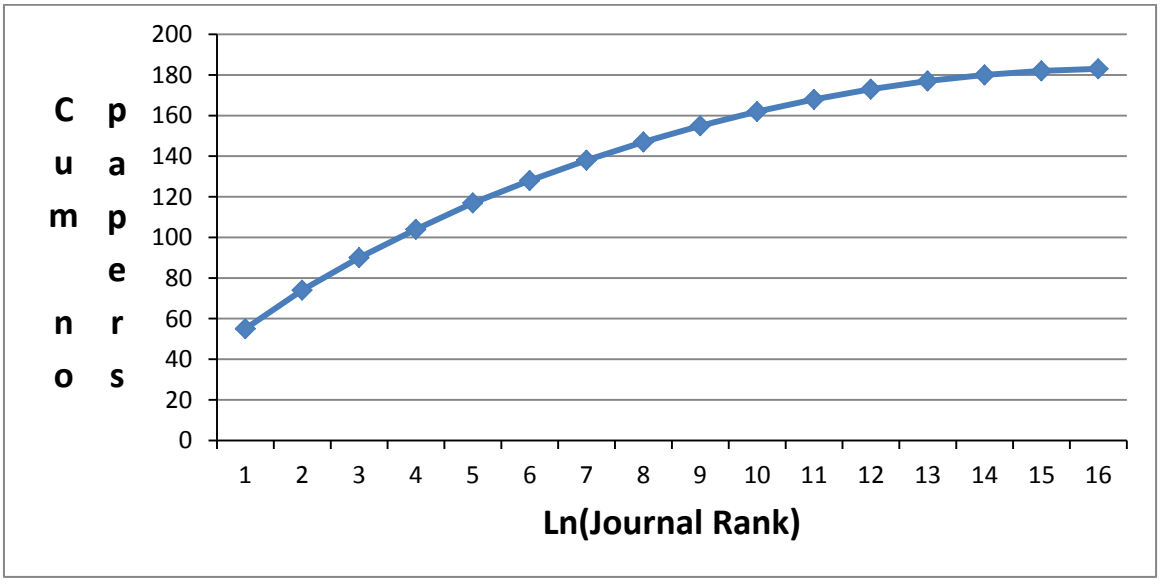

Fig. 4: *Ln (Journal Rank) vs. Cumulative Number of Papers Plot.*

Author Productivity and Lotka's law

Lotka's Law describes the frequency of publication by different authors in a given subject area, or for any institution. It states that the number of authors making contributions is about $1/n^2$ of those making one; and the proportion of all contributors, that make a single contribution, is about 60 percent. The general form of Lotka's law can be expressed as $y=c/x^n$ where y=percentage of authors, x=number of articles published by an author, c=constant and –n=slope of the log-log plot. In this study, 907 authors contributed 986 articles; on an average (0.91) authors per articles. The number of author per article is lower here. Among 907 authors, 446 authors (49.17%) contributed only one article; 140 authors (15.44%) contributed two articles; 70 (7.72%) authors contributed three articles; 57 (6.28%) authors contributed four articles and 22 (2.43%) authors contributed five articles. Hence, the author productivity in case of research trend analysis of Vidyasagar University nearly tallies Lotka's law. In general, single-authored article amounts 60% and two-authored article is 15% and three-authored article is 7%. But here single-authored article amounts 49%, which is 11% less than Lotka's value, and two-authored article amounts 15%, which tallies Lotka's value. Three-authored and four-authored article amounts 8 and 2.4% respectively, which also tallies Lotka's value. The plot of Ln(no. of authors) vs. Ln(no. of contributions) is a straight line (Figure 5) with negative slope as evident from the general form of Lotka's law, $y=c/x^n$. The values of slope and intercept are (-n) and Ln(c). The actual plot here shows an approximate straight line with convex upwards near the tail of the curve.

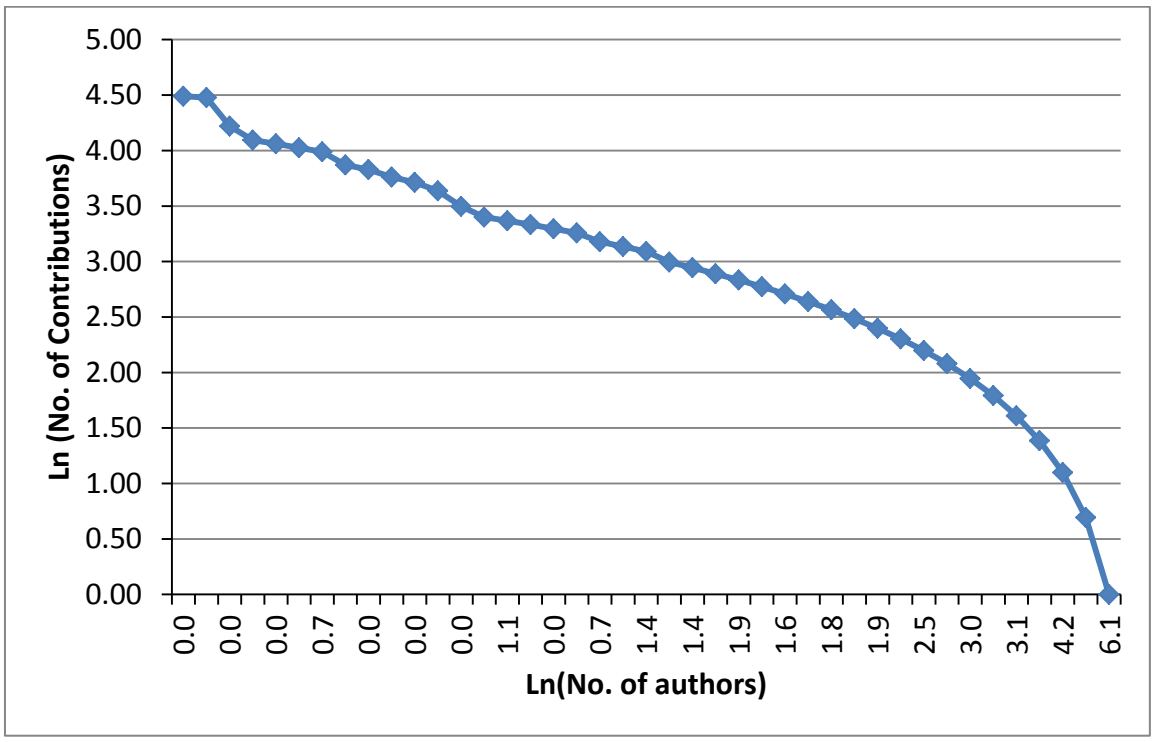

Fig. 5: *Ln (No. of Authors) vs. Ln (No. of Contributions) Plot.*

Highly Cited Papers

Bibliographical details of the papers cited more than 50 times are furnished below:

- Bar H, Bhui DK, Sahoo GP, *et al*. Green Synthesis of Silver Nanoparticles Using Latex of Jatropha curcas. *Colloids Surfaces A: Physicochem Eng Aspects*. 2009; 339(1): 134–139p. (Times cited: 190).
- Sengupta A, Pal TK. On Comparing Interval Numbers. *Eur J Oper Res*. 2000; 127(1): 28–43p. (Times cited: 130).
- Bar H, Bhui DK, Sahoo GP, *et al*. Green Synthesis of Silver Nanoparticles Using Seed Extract of Jatropha curcas. *Colloids Surfaces A: Physicochem Eng Aspects*. 2009; 348(1): 212–216p. (Times cited: 110).

- Sengupta A, Pal TK, Chakraborty D. Interpretation of Inequality Constraints Involving Interval Coefficients and a Solution to Interval Linear Programming. *Fuzzy Set Syst*. 2001; 119(1): 129–138p. (Times cited: 101).
- Maiti R, Jana D, Das UK, *et al*. Antidiabetic Effect of Aqueous Extract of Seed of Tamarindus indica in Streptozotocin-Induced Diabetic Rats. *J Ethnopharmacol*. 2004; 92(1): 85–91p. (Times cited: 83).
- Rout D, Mondal S, Chakraborty I, *et al*. Chemical Analysis of a New (1→3)-, (1→6)-Branched Glucan from an Edible Mushroom, Pleurotusflorida. *Carbohydr Res*. 2005; 340(16): 2533–2539p. (Times cited: 81).
- Pal U, Samanta D, Ghorai S, *et al*. Optical Constants of Vacuum-Evaporated Polycrystalline Cadmium Selenide Thin Films. *J Appl Phys*. 1993; 74(10): 6368–6374p. (Times cited: 76).
- Roy TK, Maiti M. A Fuzzy EOQ Model with Demand-Dependent Unit Cost Under Limited Storage Capacity. *Eur J Oper Res*. 1997; 99(2): 425–432p. (Times cited: 75).
- Ghosh D, Das S, Maiti R, *et al*. Testicular Toxicity in Sodium Fluoride Treated Rats: Association with Oxidative Stress. *Reprod Toxicol*. 2002; 16(4): 385–390p. (Times cited: 67).
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- Chakraborty I, Mondal S, Pramanik M, *et al*. Structural Investigation of a Water-Soluble Glucan from an Edible Mushroom, Astraeus hygrometricus. *Carbohydr Res*. 2004; 339(13): 2249–2254p. (Times cited: 57).
- Rout D, Mondal S, Chakraborty I, *et al*. The Structure and Conformation of a Water-Insoluble (1→3)-,(1→6)-β-d-Glucan from the Fruiting Bodies of Pleurotusflorida. *Carbohydr Res*. 2008; 343(5): 982–987p. (Times cited: 56).
- Singha PK, Roy S, Dey S. Antimicrobial Activity of Andrographis paniculata. *Fitoterapia*. 2003; 74(7): 692–694p. (Times Cited: 54).
- Mondal KC, Banerjee D, Jana M, *et al*. Colorimetric Assay Method for Determination of the Tannin Acyl Hydrolase (EC 3.1. 1.20) Activity. *Anal Biochem*. 2001; 295(2): 168–171p. (Times cited: 54).
- Bhunia AK, Maiti M. A Two Warehouse Inventory Model for Deteriorating Items with a Linear Trend in Demand and Shortages. *J Oper Res Soc*. 1998; 49(3): 287—292p. (Times cited: 51).

Table 8: *Citation Distribution.*

Times Cited	No. of Papers
Zero citation	173
1	110
2	98
3	82
4	68
5	65
6–10	165
11–15	85
16–20	36
21–25	32
26–30	15
31–35	16
36–40	9
41–45	11
46–50	4
51–100	13
>100	4

Citation Distribution among Papers

The distribution of citation among the contributed papers is presented in Table 8. In all, 986 papers received 2393 citations, i.e. 2.4 citations per paper on average. As evident from Table 8, 173 papers received no citation, 110 papers received only one citation, 98 papers received two citations, 82 papers received three citations, 68 papers received four citations and 65 papers received five citations. More than five citations are received by remaining 390 papers and more than 100 citations are received by only four papers. Only one paper received 190 citations that is the highest figure.

CONCLUSION

This study has investigated the publishing behaviour of scholars of Vidyasagar university. The twenty-eight year (1989–2014) study scanned the total number of 986 papers in the form of journal articles. The study indicates that the highest numbers of papers (129) were published in the year 2013 and lowest (2) in 1995. A sheer rise in the research publications of VU was observed during the last seven years. The overall average citation per paper (ACPP) of VU papers was 8.3. The highest ACCP (25.3) was observed in the year 2000. The IITs were main collaborators with 126 papers followed by Calcutta university, (58 papers). Among the international collaborations, university of Trieste, Italy tops the list (23 papers). The top collaborating country is USA (27 papers) followed by Italy (24 papers). The top funding agency for research is UGC (167 papers) followed by CSIR (132 papers) and DST (105 papers).

Chemistry and Mathematics are front runners as research subjects in VU. The journal, Carbohydrate Research is the most preferred journal (55 papers) followed by Applied Mathematical Modelling (19 papers) and Carbohydrate Polymers (16 papers). The most productive author is S. Sirajul Islam followed by Monoranjan Maiti and Bikas R Pati. The paper by A Misra and other four authors received highest number of citations (190). Out of 986 papers, only four papers received more than 100 and 17 papers received more than 50 citations. Uniform citation pattern however was not observed in the study.

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