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The Intellectual Patterns of Management Information System Research: A Bibliometric study on International Journal of Management Reviews

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Abstract:

The present study is modeled with the purpose to explore the quantitative and qualitative assessment of global Management Information System (MIS) research by using various bibliometric indicators on International Journal of Management Reviews (IJMR) journal literature. It examines and presents an analysis of 180 research communications published during the period 1999-2009 in the area of MIS. The present study significantly examines the various bibliometric dimensions of the journal literature such as growth of literature, authorship pattern, degree of collaboration, authors' productivity, geographical distribution, citation pattern, length of articles, institution-wise distribution of articles, journal matrix, discipline-wise distributions of articles, productive institutions and prolific authors etc.

Keywords: Bibliometrics, Management Information System, IJMR, Scientometrics, SJR, SNIP, IPP

1.0 Introduction

IJMR (International Journal of Management Reviews) is a peer reviewed academic scholarly journal published quarterly by Blackwell Publishing, United Kingdom. As the first reviews journal in the field of business management, the IJMR is an essential reference tool for business academics and MIS researchers alike, covering all the main management sub disciplines from accounting, information technology, decision science, strategy to technology management and innovation. The IJMR complements the other publications produced by the British Academy of Management and is deliberately targeted at a wide readership interested in business and management. It publishes literature surveys and reviews that are authoritative in their content, form and balance, addressing the intellectual and academic needs of the broad academic management community both in the UK and on a wider global scale. The journal has the impact factor 2.673 and h-index 47.

2.0 Objectives of the study

The main purpose of the present research work is to undertake a comprehensive study of IJMR journal literature to examine the quantum of research activities of the field, its growth, characteristics of the literature, and relationship between different components of MIS literature in terms of output

and impact. However, the present study is primarily designed to focus on various dimensions of MIS literature with the following objectives.

- i. To study the distribution of types of publications and to show the growth trend of publications;
- ii. To study the authorship profile and collaborative pattern of the research publications;
- iii. To examine the applicability of Lotka's inverse square law of scientific productivity;
- iv. To show the geographical distribution of authorship and the collaborative pattern of the most productive countries;
- v. To identify the most productive institutions and countries;
- vi. To study the discipline/school wise distribution of authors affiliations;
- vii. To study the pagination and illustration pattern of research papers;
- viii. To study the distribution of words in Abstracts and Titles of research papers;
- ix. To study the distribution of Subject Terms and author supplied Keywords;
- x. To examine the applicability of Zipf's Law on the basis of the frequency of occurrences of keywords and subject terms;
- xi. To study the referencing pattern and citation-based indices of research publications;
- xii. To show the extent of self-citations and the journal metrics.

3.0 Methodology

For carrying out the proposed research work two databases namely "EBSCOhost Research Database" and SCOPUS Database have been selected as the data sources. All the available back volume papers of the journal IJMR published during the study period i.e. 1999 - 2009 were included in this study, comprising of 10 volumes and 39 issues. The bibliographic details like, the *titles, names of authors, number of authorship, author's institutional affiliation, country and discipline, type of article, length (pages) of article, number of references, citations received, author supplied keywords, subject terms and abstracts* were downloaded from EBSCOhost while *SJR (SCImago Journal Rank), SNIP (Source Normalized Impact per Paper), IPP (Impact per Publication), total number of citations received by a journal in the year considering all documents, percentage of documents published in a year that have never been cited to date and percentage of documents in the year that are review articles* etc. were collected from the SCOPUS database. After thorough scrutiny the standardized data were compiled, tabulated and analyzed for making observations in accordance with the objective of the study through various bibliometric indicators.

4.0 Literature Review

Since its birth, Management information system (MIS) scholars have explored the past, present and future development of the field (Dearden 1972; Mason and Mitroff 1973). In the 1980s, frameworks guiding MIS research appeared and MIS being defined as a "computer based organisational

information system which provides support for management activities and functions” (Ives et al. 1980). Management information system is a relatively new academic discipline and scholarly field of study with its own cumulative tradition and history (Culnan and Swanson 1986). It draws upon several reference disciplines such as cognitive psychology, computer science, behavioral science, decision science, economics, operation management, organization theory and engineering (Culnan 1987; Baskerville and Myers 2002; Katerattanakul et al. 2006). The progressive development of the ideas represented by published research in MIS based on an author co-citation analysis were studied (Culnan Mary J 1986; 1987). In the 1990s, the field of MIS became proved as a more formalized discipline with the development of a keyword classification scheme for MIS literature (Barki et al. 1993). However, despite its history of over 30+ years, the field has not acquired a distinct identity as a well-established reference discipline (Benbasat and Zmud 2003) that is partially due to the relatively frequent change of research directions and technological advancements. The trends of publication of MIS research were attempted and the results indicate that the focus of efforts of researchers is on Information System Usage and IS Resource Management. The increasing use of more rigorous research methods like mathematical models and laboratory experiments proved that the field is attaining maturity (Palvia et al. 2004). With a quest to unfold the academic identity for the IS discipline with regard to two specific attributes like IT Artifact and IS theme reveals that the academic identity is indicated by two central and enduring intellectual cores associated with a handful of IT Artifacts and IS theme (Nevo et al 2009). Recently, some researchers also started exploring the body of knowledge published in conference proceedings. The identity and development of MIS field through a scientometric lens applied to three major global, regional and national conferences of MIS revealed that MIS field has been evolving in terms of collaborative research and scholarly output has been gradually moving towards academic maturity and the leading conference contributors tend to establish loyalty to a limited number of academic meetings (Cocosila et al. 2011). In a study to assess the reciprocal and shared impact of LIS/MIS fields unmask that the impact of MIS on LIS is greater than the reverse (Sugimoto et al.2011). While some scholars have tried to identify the progress of MIS as a scholarly field of study others tried to map the intellectual structure of MIS. In order to conduct various studies on MIS the authors have relied upon and taken the required datasets from different journals like, *MIS Quarterly*, *CACM (Journal Communications of the ACM)*, *Management Science*, *AMJ (Academy of Management Journal)*, *AMR (Academy of Management Review)*, *ASQ (Administrative Science Quarterly)*, *IEEE Conference Proceedings*, *International Conference of Information Systems Proceedings* and *Social Sciences Citation Index database*. Citation analysis, author co-citation analysis of published research in MIS, keyword classification scheme for MIS literature, scientometric study of MIS literature published in conferences of MIS, the reciprocal and shared impact of LIS/MIS fields, trends of publication of MIS research, usage of research methods in MIS literature, subfields that constitute MIS research, the diffusion of the ideas represented by these

subfields to other disciplines are the various kinds of studies attempted by the authors through these literature.

5.0 Observation and Analysis

Table-1 represents a general view of the dataset of IJMR articles on the basis of which analysis has been conducted from various bibliometric dimensions. It is observed that altogether 180 publications appeared during 11 years of study period within 1 to 11 volumes and 39 issues. The average number of publication per year is 18 and publication per issue of IJMR is **4.6** that mean four to five articles are being published in each issue of IJMR journal.

5.1 Distribution of types of Publications

Out of 180 contributions, the highest are “Research Papers” (RP = 156) that accounts for 86.7% of the total contributions followed by “Editorials” (15 papers, 8.3 %), “Author Index” (5 papers, 2.8%) and “Prefaces & Forewords” with (4 papers, 2.2%) respectively. Though short communications (SC) have found place in each and every volume of IJMR but their presences are not so frequent. Further it is observed that the proportion of SC has decreased during the 2nd half of the period of the study commencing from the year 2002, whereas the number of RPs is showing an increasing trend particularly during this period.

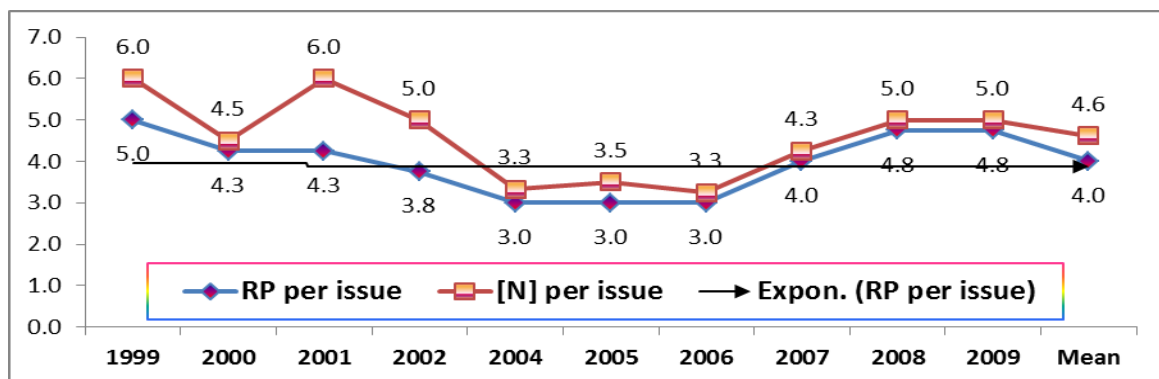


Figure – 1: Growth Trend of RPs & Total Publications [N] per issue

Both the Trend Lines in figure – 1 shows a sequential growth pattern from 2003 onwards indicating growth of publications in the journal. The wide gap between the trend lines during 1995 to 2002 implies the appearance of sizable number of SCs. The exponential trend line for both the series data also shows a linear growth trend during the period of the study. The average number of RP per issue is 4 (varies between 3 and 5) and the mean Publication [N] per issue 4.6 (varies between 3 and 6) indicates that publication pattern is consistent with respect to the average number of papers published per year.

5.2 Authorship Pattern

Table - 1 deals with authorship pattern of the journal IJMR during the year 1999 to 2009. It was observed that 156 number of RPs are contributed by 334 numbers of authors which reflects that the average number of authors per papers is **2.14**. Out of 156 papers, 53 (33.97%) numbers of papers are contributed by single authors and 103 (66.03%) numbers by multiple authors. Further it is observed that the contributions of two and three authored papers are very high that is 54 (34.6%) and 33 (21.2%) respectively and both cover almost of 56% of total RPs. On the contrary, contributions of four and five or above authored papers are relatively less in number i.e. 10 (6.4%) and 6 (3.85%) respectively. As the multi-authored papers are dominant, it can be inferred that the collaborative research is at the front in IJMR literature.

Table – 1: Year wise distribution of Authorship Pattern of IJMR (Research Papers)

No. of Authors >		One		Two		Three		Four		> = Five		Total RP	Total Authorship (TA)	Mean Authorship
SL. No.	Year	No.	%	No.	%	No.	%	No.	%	No.	%			= (TA/RP)
1	1999	9	17.0	8	14.8	3	9.1	0		0		20	34	1.70
2	2000	4	7.5	7	13.0	6	18.2	0		0		17	36	2.12
3	2001	11	20.8	3	5.6	3	9.1	0		0		17	26	1.53
4	2002	6	11.3	1	1.9	3	9.1	3	30.0	2	33.3	15	39	2.60
5	2004	1	1.9	3	5.6	3	9.1	0	0.0	2	33.3	9	26	2.89
6	2005	5	9.4	2	3.7	3	9.1	1	10.0	1	16.7	12	30	2.50
7	2006	4	7.5	5	9.3	2	6.1	1	10.0	0	0.0	12	24	2.00
8	2007	3	5.7	9	16.7	3	9.1	1	10.0	0	0.0	16	34	2.13
9	2008	7	13.2	4	7.4	4	12.1	3	30.0	1	16.7	19	45	2.37
10	2009	3	5.7	12	22.2	3	9.1	1	10.0	0	0.0	19	40	2.11
Total		53	100	54	100	33	100	10	100	6	100	156	334	2.14
% w.r.t RP		33.97		34.6		21.2		6.4		3.85		100		
Authorship		53		108		99		40		34			334	
Authorship %		15.87		32.3		29.6		11.98		10.18			100	

5.3 Degree of Collaboration

The degree of collaboration among the authors was calculated using Subramanian's formula (Subramanian, 1983) and presented in figure - 2. It is observed that the collaboration co-efficient varies from minimum value of 0.35 (2001) to maximum value of 0.84 (2009) during the period of study and the mean collaboration co-efficient is **0.67** and the standard deviation is 0.15. This indicates

that IJMR has accommodated more number of collaborative works than single authored ones throughout the period of study.

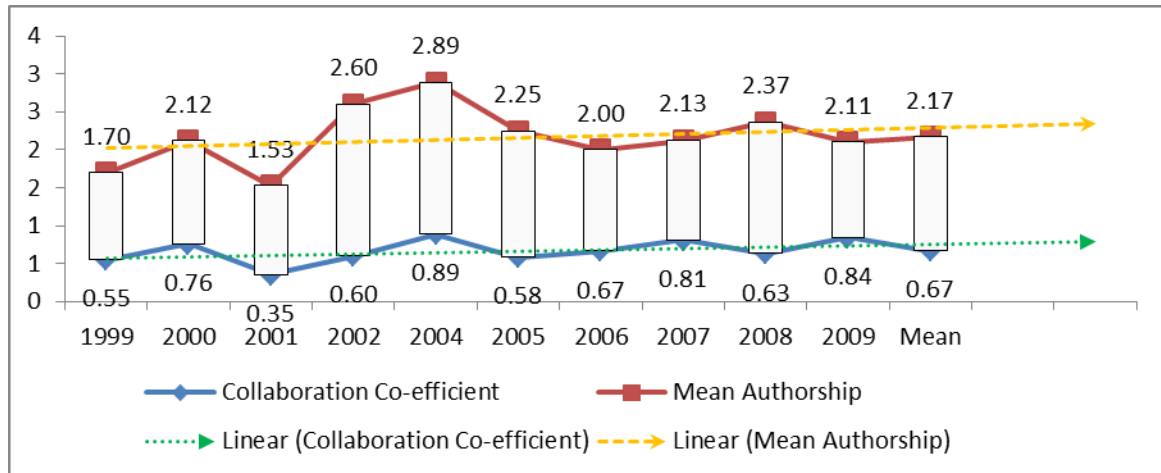


Figure – 2: Degree of Collaboration and Mean Authorship of IJMR Research Papers

5.4 Application of Lotka’s inverse Square Law of Scientific Productivity

Measuring of author productivity is a vital part of the metric study is induced for the present research and presented in table - 2. The general formula of Lotka's Law is:

$$X^n Y = C \quad \text{and Parameter (n)} = \frac{\text{Log } C - \text{Log } Y}{\text{Log } X}$$

- Where,
- X = Number of publications (1, 2, 3 , n)
 - Y = Relative frequency of authors with X publications
 - C = Constant which is equal to number of contributors with minimal Productivity (No. of authors contributing single paper)
 - n = Parameter “n” can be calculated by least square method in the simple regression model.

Table - 2: Number of expected Authors derived using Lotka’s inverse Square Law

No. of contributions "X"	Log X	No. of Authors Observed "Y"		Log Y	Total Contributors		n = (Log C - Log Y)/Log X	POWER (n,4.03)	Estimated Frequency of Authors	
		No.	%		No.	%			No.	%
1	0.000	283	93.09	5.645	283	85.50		1.00	283	92.79
2	0.693	16	5.26	2.773	32	9.67	4.14	16.34	17	5.68
3	1.099	4	1.32	1.386	12	3.63	3.88	83.71	3	1.11
4	1.386	1	0.33	0.000	4	1.21	4.07	266.87	1	0.35
		304	100	5.717	331	100	4.03		305	99.92
							Mean			

C = No. of Authors with minimal productivity (i.e. 283) & Log C = 5.645

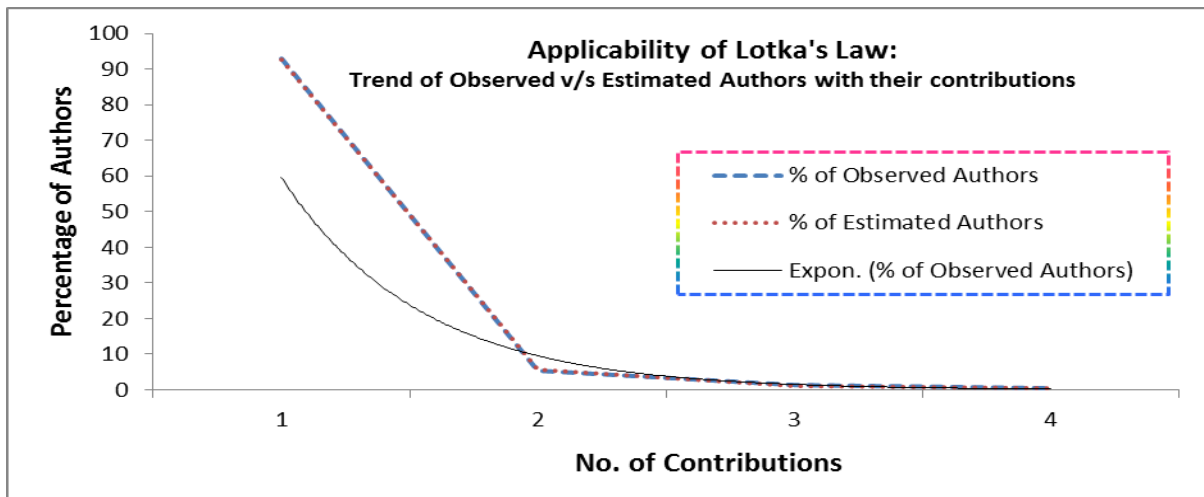


Figure – 3: Trend of Observed v/s Estimated Authors with their contributions

It envisages that, a highest 283 number of authors of out of 304 have contributed single paper each and its proportion is 93.09% which gives the value of *Constant* (C) which is equal to *number of contributors with minimal productivity*. Table - 121 gives the value of “n” using the above equation and mean value of “n” was found to be 4.03. Using the value of parameter “n” (4.03), the estimated frequencies of authors were calculated and presented in table - 121. Figure – 3 illustrates the variation of observed and estimated authors’ percentile with their contributions respectively.

In order to test the applicability of Lotka’s law to a set of data, a statistical test (goodness-of-fit) is needed. Table – 4 estimates the deviation for observed and estimated frequency functions along with the maximum deviation, **Dmax** [$Max / Fo(x) - Sn(x) /$] as per the K-S (Kolmogorov-Smirnov) test. At a 0.01 level of significance, the K-S statistic is equal to $1.63/\sqrt{n}$. If D is greater than the K-S statistic, then the sample distribution does not fit the theoretical distribution. As shown in table - 122, D from the IJMR data is **0.0031** which is less than the K-S statistic i.e. $1.63/\sqrt{304} \sim 0.0935$. As the value of D is less than 0.0935, Lotka’s generalized formula fits to the IJMR sample.

Table – 4: Kolmogorov-Smirnov (K-S) Goodness-of-fit test

No. of contributions	Observed Authors			Estimated Authors			Deviation	Dmax
	No.	Cumulative Frequency	Relative Frequency { Sn(x) }	No.	Cumulative Frequency	Relative Frequency { Fo(x) }	D= Fo(x)- Sn(x)	Max of Fo(x)- Sn(x)
1	283	283	0.9309	283	283	0.9279	-0.0031	0.0031
2	16	299	0.9836	17	300	0.9847	0.0011	
3	4	303	0.9967	3	304	0.9958	-0.0010	
4	1	304	1.0000	1	305	0.9992	-0.0008	
Total	304			305				
K-S statistics = 1.63/SQRT(n = 304) --- >								0.0935

5.5 Productivity Index (PI)

Table – 5: Productivity Index and Level of Contributions of Authors in IJMR

Productivity Index (PI)	No. of Authors	% of Authors	% of Contributions	Level of contributions
PI = 0 (1 article)	283	93.09	85.50	Larger producers
0 < PI < 1 (2 - 9 articles)	21	6.91	14.50	Intermediate producers
PI >= 1 (10 or more a)	0	0.00	0.00	Occasional producers

With regard to the above aspect of Lotka’s law, the index called Productivity Index (PI) has been applied to identify the level of classification of authors. The PI is the logarithm of the values of n publications for each author. The PI table – 5, reveals that occasional producers (93% authors) who published only one paper each (PI = 0) contribute as much as 85.5% of total IJMR literature while intermediate producers (7% authors) who published 2 – 9 papers (0 < PI < 1) contribute rest (14.5%) of IJMR literature in absence of larger producing group (who published more than 10 papers & PI >= 1).

5.6 Prolific Authors

The table - 6 illustrates the rank list of most prolific authors contributed to IJMR literature during the period of study. Here the rank list of prolific authors has been derived on the basis of two approaches namely, *straight count approach* and *equal credit scoring*.

Table – 6: Ranking of Prolific Authors (by Straight Countv/s Equal Credit Method)

Sl. No.	Authors	Country	Straight Count Method		Equal Credit Method	
			No.	Rank	Score	Rank
1	Wilkinson, Adrian	Australia	4	1	1.58	2
2	Bessant, John	UK	3	2	0.87	6
3	Bowman, Cliff	Belgium	3	2	1.50	3
4	Debackere, Koenraad	UK	3	2	1.08	4
5	Neely, Andy	UK	3	2	0.73	7
6	Barling, Julian	Canada	2	3	1.00	5
7	Boxall, Peter	New Zealand	2	3	1.00	5
8	Hassard, John	UK	2	3	2.00	1
9	13 Authors (each having 2 RPs)	5 Countries	26	3	< 1	...
10	283 Authors (each having One)	38 Countries	283	4
	303 (unique Authors)	28	331		156.83	...

It is observed that, altogether 331 authors have contributed to IJMR during the study period out of which 303 are unique authors. It is observed that rank list of authors as per ‘Straight Count Approach’ and ‘Equal Credit Scoring’ varies a lot. As per Straight Count approach *Wilkinson, Adrian* (Australia) holds the rank 1 with 4 contributions while rank 2 occupied by 4 authors namely *Bessant, John* (UK) ,

Bowman, Cliff (Belgium), *Debackere, Koenraad* (UK), and *Neely, Andy* (UK) contributing 3 each. Similarly rank 3 is occupied by 16 numbers of authors out of which only 3 names are listed in rank list as their equal credit score is 1 or more. Around 85% (283) of authors contribute only one research paper to the IJMR literature. On the other hand as per Equal Credit Method out of 8 number of top authors only 4 Authors scored above 1 namely, *Hassard, John* (UK) at rank 1; *Wilkinson, Adrian* (Australia) at rank 2; *Bowman, Cliff* (Belgium) at rank 3; and *Debackere, Koenraad* (UK) at rank 4. Further, it is observed that out of most prolific authors, 50% of authors are from UK. Dominance of UK over other countries as regards to the prolific authors is due to the reason that UK is the host country of IJMR journal.

5.7 Geographical Distribution of Authorship

Assessment of country and institutional research productivity has a long standing tradition of bibliometric studies. The share of major nations to IJMR research on the basis of authors' affiliation considering "all authors" as well as considering the "first author" only is shown in the above table – 7.

Table – 7: Country-wise contributions of Authors

Sl. No.	Considering All Authors				Considering only 1st Authors			
	Country of Affiliation	No.	%	Rank	Country of Affiliation	No.	%	Rank
1	UK	150	45.32	1	UK	66	42.31	1
2	USA	34	10.27	2	USA	17	10.90	2
3	Australia	30	9.06	3	Australia	16	10.26	3
4	Canada	24	7.25	4	Canada	12	7.69	4
5	Belgium	19	5.74	5	Belgium	7	4.49	5
6	Spain	12	3.63	6	Spain	5	3.21	6
7	Netherlands	10	3.02	7	Netherlands	5	3.21	6
8	Germany	8	2.42	8	Germany	4	2.56	7
9	Hong Kong	6	1.81	9	Hong Kong	2	1.28	9
10	Italy	5	1.51	10	Italy	3	1.92	8
11	New Zealand	5	1.51	10	New Zealand	3	1.92	8
12	Others (17 Countries)	28	8.46	...	Others (12 Countries)	16	10.26	...
Total	28	331	100	...	23	156	100	...

A total of 331 authors occurred in the affiliations when considered all authors and 156 authors occurred when considered only single author. It is reflected that UK alone accounts for 45.32% of the affiliating countries (150 authors belong to UK) when considered all authors and 42.31% (66 authors belong to UK) when considered only first authors and tops the rank among the most productive countries. USA accounts for 10.27% of total author affiliation followed by Australia (9.06%) and both the countries occupied the second and third rank respectively. The other countries of affiliation of

authors are Canada (7.25%), Belgium (5.74%), Spain (3.63%), Netherlands (3.02%), Germany (2.42%), Hong Kong (1.81%), Italy and New Zealand (1.51%) respectively occupied 4th to 10th rank. A similar trend is also observed when considered the first authors of the IJMR research up to rank 6 and then after a little deviation is observed in ranking pattern of most productive countries.

5.8 Year-wise Activity Index (AI) of Most Productive Countries v/s Rest of World

The Activity Index (AI) of five most productive countries and rest of the world (23 countries) are plotted in figure -4. Out of the most productive countries UK tops the list followed by USA, Australia, Canada and Belgium. AI = 100 implies the country's year-wise output corresponds to the world average. AI > 100 reflects higher than average output and AI < 100 reflects lower than average by that country.

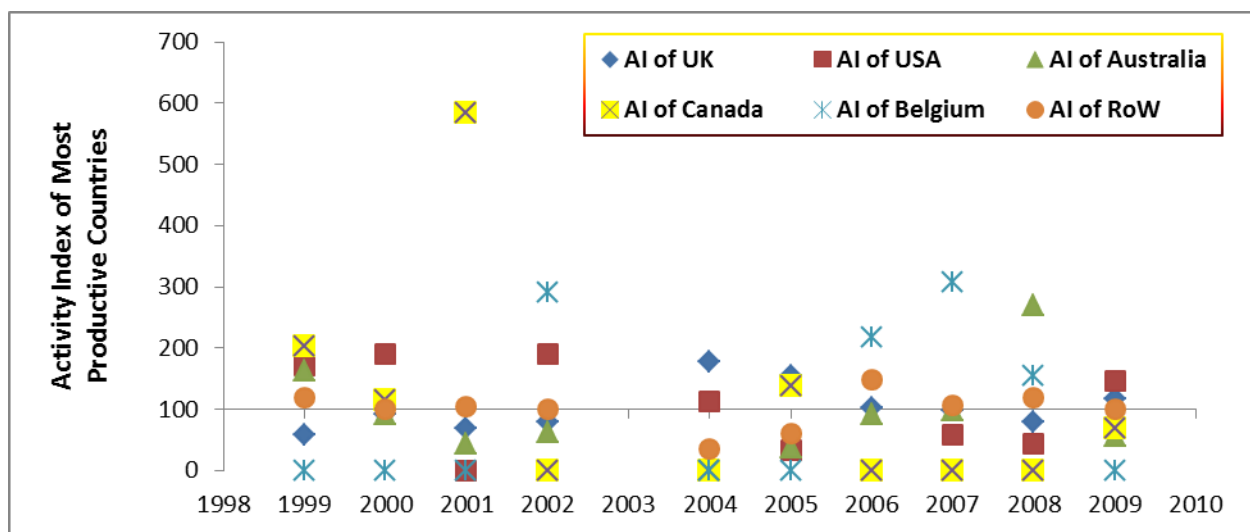


Figure - 4: Activity Index (AI) of UK, USA, Australia, Canada, Belgium v/s Rest of World

The AI of UK is higher than 100 in the years 2004 - 2006 & 2009. Similarly AI of USA is higher than 100 during the year 1999-2000, 2002-2004 & 2009. AI of Australia is higher than 100 during the year 1999 and 2008, AI of Canada is above average during the year 1999-2001 & 2005 while AI of Belgium is higher than 100 during the year 2002 & 2006-2008. The AI of Rest of the World (RoW) is more than 100 during the years 1999, 2001 & 2006-2009.

5.9 Domestic and International Collaborative Profile of Most Productive Countries

Domestic and international collaborative profile of most productive countries has been calculated using Domestic Collaborative Index (DCI) and International Collaborative Index (ICI) and presented in figure – 5 along with trendlines. It is observed that, UK tops the list with 127 number of Domestic Collaborations (DCI = 117). The other countries having above average DCI (>100) are USA (DCI =105), Australia (DCI=106) and Canada (DCI=121). The reasons for higher values of DCI for these countries are mainly due to the highest number of affiliated institutions (more than 10 in each case

and all together 65%) belong to these 4 countries. In case of ICI, a reverse trend is observed i.e. all other countries whose DCI are below average exhibit above average values of ICI (Figure – y). This can be explained on the basis of the argument provided Frame and Carpenter (1979) that “...international collaboration is inversely proportional to the size of the scientific enterprise in a country and more basic in the field, greater the probability of international co-authorship ...”. The ICI for UK, USA, Australia and Canada are less than world average which indicates these countries do not require a higher magnitude of international collaboration.

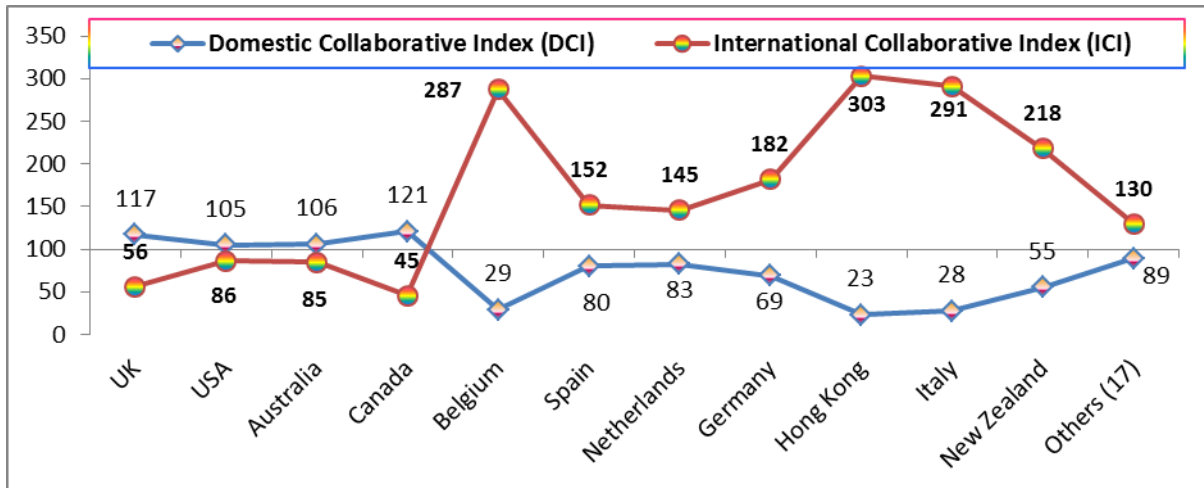


Figure – 5: DCI and ICI of Most Productive Countries

5.10 Most Prolific Institutions

Table - 8: Rank list of Most Prolific Institutions

Sl. No.	Name of Institute	Country	Straight Count Method			Equal Credit Method	
			No.	%	Rank	Score	Rank
1	Cranfield University	UK	20	6.04	1	6.80	2
2	Queen's University	Canada	13	3.93	2	6.00	3
3	Loughborough University	UK	11	3.32	3	4.00	4
4	University of Warwick	UK	11	3.32	3	3.70	5
5	Manchester Metropolitan University	UK	10	3.02	4	6.83	1
6	University of Manchester	UK	8	2.42	5	3.67	6
7	Nottingham University	UK	7	2.11	6	2.50	10
8	Monash University	Australia	7	2.11	6	2.83	9
9	Aston University	UK	6	1.81	7	3.03	8
10	Manchester University	UK	6	1.81	7	3.25	7
13	59 Institutions (having 2 to 5 Authors)	16 Countries	153	46.22	8 - 11
14	79 Institutions (each having one)	22 Countries	79	23.87	12
Total	148	28	331	100	

Table - 8 provides the rank list of most prolific institutions contributed to IJMR literature during the study period. The rank list of prolific institutions has been derived on the basis of two approaches namely; (a) number of contributors affiliated by straight count method and (b) scoring of affiliated institutions by equal credit method. It is observed that, the contributions to IJMR have been rendered from 148 institutions distributed over 28 countries by 331 authors. The rank list of institutions as per straight count is: *Cranfield University* (UK) – 1st, *Queen’s University* (Canada) – 2nd, *Loughborough University* (UK) & *University of Warwick* (UK) – 3rd. The rank list of institutions as per equal credit method is: *Manchester Metropolitan University* (UK) – 1st, *Cranfield University* (UK) – 2nd, *Queen’s University* (Canada) – 3rd. It is observed that out of 10 prolific institutions 8 are located at UK. Out of 148 affiliated institutions, 79 (53.5%) institutions having only one contributor each which can be considered as occasional contributors (24%) while 64 (43.5%) institutions having contributors between 2 to 9 can be considered as intermediate contributors (57%). A relatively very less institutions (5; 3%) having 10 or more representations of authors can be considered as larger contributors (20%).

Table - 9: Country-wise Distribution of Affiliated Institutions

Country	Considering All Authors		Considering 1st Authors only	
	No. of Affiliated Institutions	%	No. of Affiliated Institutions	%
UK	49	33.1	39	35.5
USA	20	13.5	13	11.8
Australia	15	10.1	12	10.9
Canada	10	6.8	8	7.3
Belgium	7	4.7	6	5.5
Spain	7	4.7	4	3.6
Germany	6	4.1	3	2.7
Netherlands	5	3.4	4	3.6
6 Countries (each having 2 - 4 Inst.)	15	10.1	11	10.0
14 Countries (each having 1 Inst.)	14	9.5	10	9.1
Total	148	100	110	100

The country- wise distribution of affiliated institutions on the basis of all authors and first authors are derived and presented table – 9. The affiliated institutions are 148 in number when all authors are considered and when the first author is considered the institutions are 110 in number. UK leads in the country-wise distribution of affiliated institutions as 49 institutions that accounts for 33.1% of the total affiliated institutions belong to UK followed by USA with 20 (13.5%), Australia with 15 (10.1%), and Canada with 10 (6.8%) affiliated institutions. The similar trend is also observed when the first authors of the affiliated institutes are considered as UK, USA and Australia occupy 1st, 2nd and 3rd position respectively in terms of country-wise distribution of affiliated institutes. In both the

cases UK dominates over other countries as a significantly higher number of affiliated institutions considering all Authors (33.1%) and 1st Author (35.5%) is due to the reason that UK is the host country of IJMR journal. This ranking pattern exhibits all most same pattern as observed in geographical distribution of authorship. Thus it can be concluded that the most productive countries those having more number of affiliated institutions also have highest number of contributing authors.

5.11 Discipline-wise Distribution of Authors Affiliations

It is observed that the intellectual substance of IJMR research is influenced by number of disciplines and among those disciplines *Management* tops the list as 100 authors that accounts for 30.2% of the total affiliation of the authors belong to this discipline. The other major disciplines/schools from which contributions have been made to IJMR research are *Business Administration* (94 authors belong to this discipline, 28.4%), *Economics* (12 authors, 3.6%) and *Psychology* (11, 3.3%). Apart from these a host of other disciplines contributed to the intellectual domain of IJMR enlisted in the table – 10. Though the total output of IJMR journal literature is highly influenced by contributors of number of disciplines but narrow down further into their broad areas, it is observed that all most 91% of contributions are from *Management* (65%), *Computer Science & Information Technology* (7%), *Engineering* (4%), and *Others* (15%) while *MIS* (as an academic discipline) having only 9% of total contributors. This indicates the inter-disciplinary nature of IJMR journal literature as well as *MIS* discipline.

Table – 10: Rank list of Disciplines w.r.t. All Authors

Rank	Schools/Departments	No. of Authors affiliated	%
1	Management	100	30.21
2	Business Administration	94	28.40
3	Economics	12	3.63
4	Psychology	11	3.32
5	Marketing Management	9	2.72
6	Human Resource Management	7	2.11
7	Organizational Behavior	6	1.81
8	Law	5	1.51
9	Public Health	5	1.51
10	23 Disciplines (each having 2 - 4 Authors)	60	18.13
11	22 Disciplines (each having one)	22	6.65
Total	Contributions scattered over 54 Disciplines	331	100

5.12 Pagination Pattern of Research Papers

Table – 11 depicts the pagination pattern of IJMR publications. All the 156 RPs are consisting of 3491 of pages of which highest (74) numbers of papers are within 21-30 pages which accounts for

47.4% of the total pagination pattern. The next highest numbers of articles (66, 42.3%) are within 11-20 pages, followed by 10 articles within the page range of 31-40 pages. Only 2 numbers of articles are within 1-10 pages whereas only 4 articles within 41-50 pages. Average number of pages per paper is **22** and around 90% of total papers are within the range of 11-30 page counts. *Normalized page size* method is being used to determine the relative contribution of authors which divides the number of pages by the number of authors. However, the results obtained by this method can be distorted by strict page limits of journals and there is no reason to hypothesize that the contribution of a longer paper is more significant than that of a shorter one.

Table - 11: Pagination Pattern of Research Papers

Sl. No.	Pagination	Number of RP	% of RP	Total Pages	Avg. Pages per RP
1	1-10	2	1.3	20	10.0
2	11-20	66	42.3	1165	17.7
3	21-30	74	47.4	1802	24.4
4	31-40	10	6.4	333	33.3
5	41-50	4	2.6	171	42.8
6	50+	0	0.0	0	-
Total		156	100	3491	22.4

5.13 Illustrations Pattern of Papers

Table – 12: Year wise distribution of Charts, Diagrams and Graphs in Papers

Sl. No.	Year	No. of RPs	Diagram	Chart	Graph	Total Illustrations		Illustrations per RP	RPs without Illustrations	
						No.	%		No.	%
1	1999	20	19	6	3	28	7.6	1.4	11	16.2
2	2000	17	19	33	1	53	14.4	3.1	5	7.4
3	2001	17	10	18	0	28	7.6	1.6	11	16.2
4	2002	15	11	14	0	25	6.8	1.7	15	22.1
5	2004	9	6	7	0	13	3.5	1.4	9	13.2
6	2005	12	9	7	0	16	4.4	1.3	6	8.8
7	2006	12	16	29	0	45	12.3	3.8	1	1.5
8	2007	16	25	36	1	62	16.9	3.9	1	1.5
9	2008	19	13	25	0	38	10.4	2.0	6	8.8
10	2009	19	13	45	1	59	16.1	3.1	3	4.4
Total		10	156	141	220	6	367	100	68	100
Mean		15.6	14.1	22	0.6	36.7		2.3	6.8	
Standard Deviation		3.41	5.39	13.00	0.92	16.59	4.52	0.96	4.40	

Table - 12 depicts the Photos, Diagrams, Charts, and Graphs that are included in the IJMR research publications during the period under study. Total numbers of illustrations are 367 which are present in 156 RPs. The number of charts is highest followed by diagrams and graphs which figures 220, 141, 6 respectively. The presence of charts (60%) and diagrams (38%) are prominent among all type of the illustrations. The mean illustrations present per article are **2.3**. The presence of graphs, charts and diagrams in any intellectual output shows the contributors creativity, innovation and presentation skills which are clearly reflected through IJMR publications.

5.14 Distribution of Words in Abstracts and Titles of IJMR Research Papers

The abstract word count of publications has been done with the sole purpose to know the general length of the abstracts as well as the share of *informative abstracts* and *descriptive abstracts* in IJMR journal literature. It is observed that maximum number of abstracts (51) fall in the word range of 101-150 which constitute 32.7 % of total RPs. The second highest number of abstracts (47; 30.1%) within the word range of 151-200 followed by 26 number of abstracts in two different ranges i.e. 51-100 and 201-250 while only 6 number of abstracts having more than 250 words. So above and all it is observed that the most of the abstracts of IJMR research publications (around 83%) are more than 100 words and average words per abstract is **152** during the period of study. This indicates that **informative abstracts** are more preferred choice of authors than the **descriptive** ones as only 17% of abstracts having less than 100 words limit.

Table - 13: Distribution of Words in Abstracts

Sl. No.	Words in Abstract	No. of Abstracts	% of Abstracts	Total Words	Avg. Words per Abstract
1	1 - 50	0	0.0	0	NA
2	51 - 100	26	16.7	1960	75
3	101 -150	51	32.7	6294	123
4	151 - 200	47	30.1	8149	173
5	201 - 250	26	16.7	5647	217
6	251+	6	3.8	1668	278
Total		156	100	23718	152

Table – 134 provides a comparative view of word length of abstracts as well as titles in terms of IJMR RPs. All the titles of 156 RPs have been analyzed with regard to total number of words, percentage of words and average words per title. It reflects that the total word counts of 156 titles of IJMR RPs are **1537** and there is not much variation in the number of words per title as standard deviation is only 1.44. The average number of words per title varies between 7 to12 and mean words per title is **10** and this is within accepted length of an ideal title. The quantitative data about abstracts reflect that the total word counts in abstracts for the 156 RPs are **23718**. The average word length of abstracts per

publication varies from minimum 104 in the year 2000 to maximum 181 in 2006 and that gives a mean average of **154** words per abstract. The major variation of total numbers of words from year to year is due to the variation in the numbers of research publications.

Table - 14: Year wise distribution of Number of Words in Abstracts and Titles

SL. No.	Year	No. of Research Papers (RP)	Abstract Word Count		Avg. No. of Words in Abstracts	Title Word Count		Avg. No. of Words in Titles
			No	%		No	%	
1	1999	20	2692	11.9	135	171	11.1	9
2	2000	17	1760	7.8	104	151	9.8	9
3	2001	17	2290	10.1	135	161	10.5	9
4	2002	15	2499	11.0	167	176	11.5	12
5	2004	9	1441	6.3	160	103	6.7	11
6	2005	12	2077	9.1	173	117	7.6	10
7	2006	12	2167	9.5	181	88	5.7	7
8	2007	16	2434	10.7	152	157	10.2	10
9	2008	19	3392	14.9	179	222	14.4	12
10	2009	19	2966	13.1	156	191	12.4	10
Total		10	23718	104		1537	100	
Mean		16	2372		154	154		10
Standard Deviation			566.93		23.97	41.04		1.44

5.15 Zipf's Law applicability for Subject Terms of IJMR journal literature

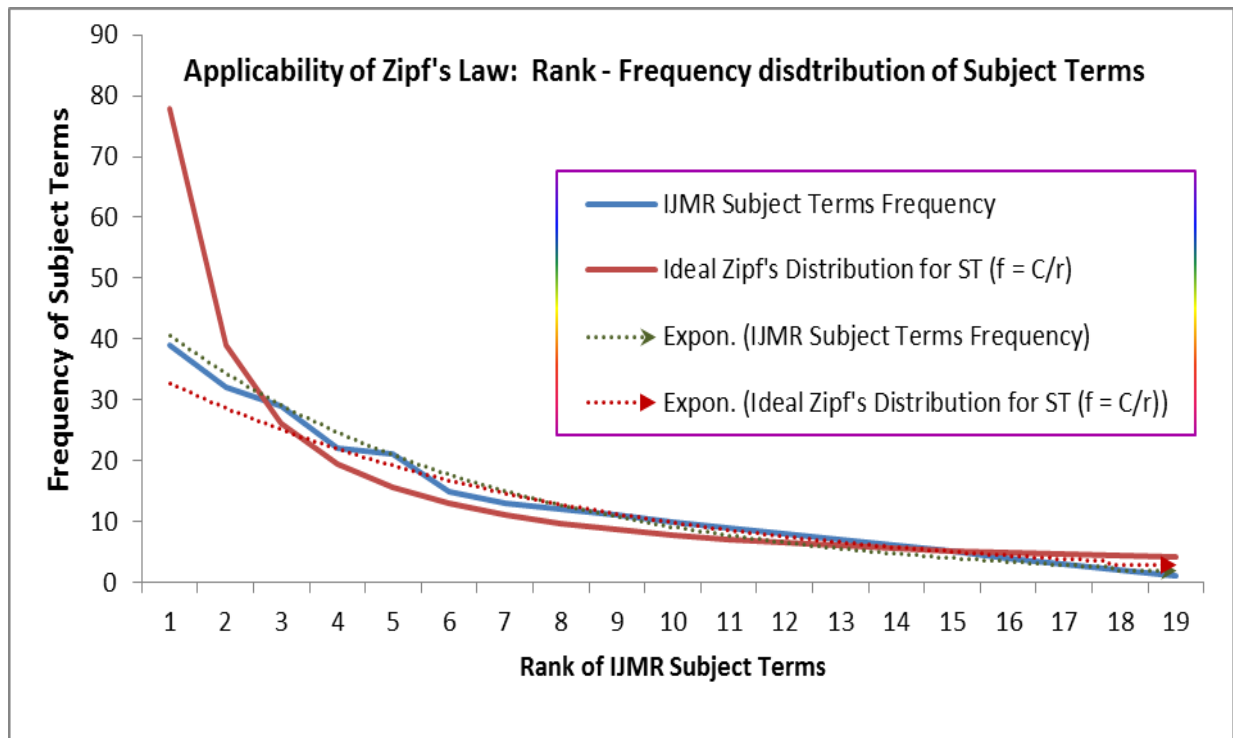


Figure - 6: IJMR Subject Term distribution v/s Ideal Zipf's distribution

Zipf's law states that if the words in a given text are ranked by the frequency of the occurrence, then the frequency of the second most common word is half the frequency of the most common word; frequency of the third most common word a third; and so on.

i.e., $Frequency\ of\ rank\ N = (Frequency\ of\ rank\ 1) / N$

To examine whether the observed rank – frequency pattern of Subject Terms of IJMR journal literature exhibits any similarity to that of Zipf's Law, the estimated frequencies were calculated and plotted in figure - 72. It shows the frequency distribution of Subject Terms in IJMR journal literature follows Zipf's distribution. Further to bring more clarity on similarity of observed distribution against ideal distribution, exponential trend lines were drawn which exhibit similar behavior to that of Zipfian curve.

5.16 Reference Pattern

Listing of references in publications is a convention among researchers for giving recognition to the value of previous work and citation analysis is an established technique used to measure the impact of individual articles, periodicals, authors that traces a connection between two documents one which cites and other which is cited. Figure - 7 indicates the range of references of research papers appeared in IJMR. A total of 95 (60.9%) articles top the list with references more than 50. This is followed by 25 (16%) articles between the range of 1-10, 17 (10.9%) articles between the range of 41-50, 9 (5.8%) articles between the range of 31-40, 6 (3.8%) articles between the range of 11-20 and the lowest of 4 (2.6%) articles between the range of 21-30. Since 80% of the articles having more than 20+ references in IJMR, it can be stated that the contributors of IJMR refer a good number of research papers while submitting their manuscripts.

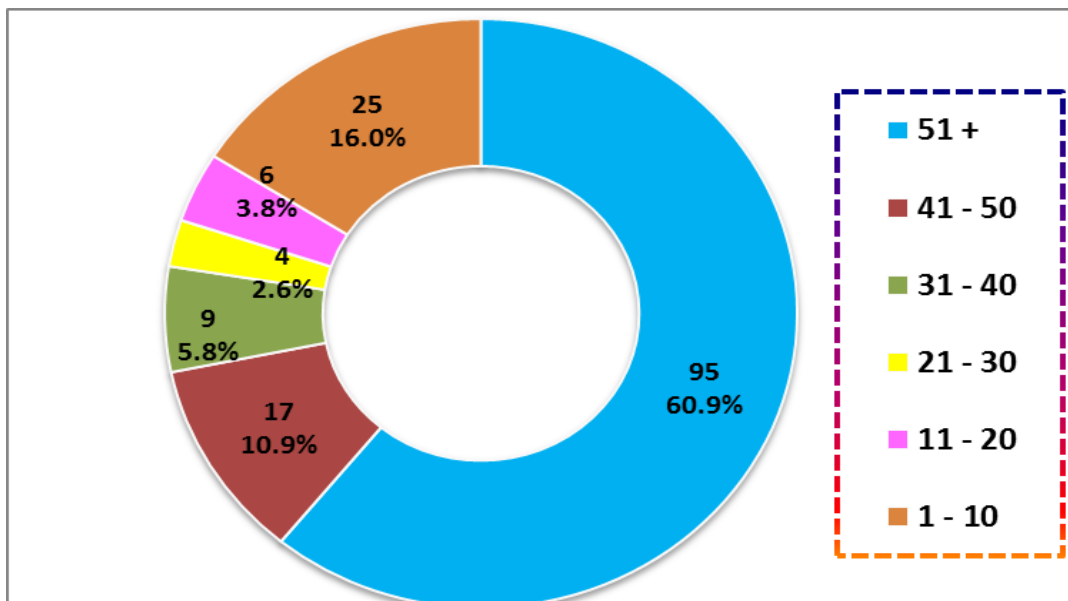


Figure – 7: Referencing pattern in IJMR

5.17 Citation Pattern and IJMR Journal Metrics

Table – 15 represents journal metrics of IJMR obtained from SCOPUS database in terms of total citations received, citations received without Journal Self Citations, with journal Self Citations, percentage of papers not cited, SJR (SCImago Journal Rank), SNIP (Source-Normalized Impact per Paper) and IPP (Impact per Publication).

Table – 15: SCOPUS Journal Analyzer for IJMR

Year	Citations (SCOPUS)		Self citations		% not cited	SJR	SNIP	IPP
	with self-citation	without self-citation	No.	%		SCImago Journal Rank	Source Normalized Impact per Paper	Impact per Publication
2000	7	6	1	14.3	0.0	0.119	0.827	0.250
2001	34	27	7	20.6	0.0	0.473	0.904	0.676
2002	46	37	9	19.6	0.0	0.338	0.842	0.732
2003	64	61	3	4.7	0.0	0.224	1.240	0.529
2004	87	76	11	12.6	0.0	0.530	1.356	0.794
2005	177	159	18	10.2	0.0	0.411	2.087	1.160
2006	256	234	22	8.6	0.0	0.543	1.191	0.773
2007	370	341	29	7.8	0.0	1.325	1.198	1.618
2008	526	498	28	5.3	0.0	1.351	1.650	2.150
2009	737	695	42	5.7	0.0	1.086	2.485	3.065
Mean	230	213	17	10.9	0.0	0.640	1.378	1.175
SD	244.44	231.80	13.20	5.73	0.00	0.45	0.55	0.87

It is observed that the total citations received by the IJMR publications are showing an increasing trend from 2000 to 2009. Highest citations (737) received in the year **2009** and the mean citation received is **230**. The Journal analyzer metrics without Journal Self Citations follows the same pattern observed in case of total citations as reflected in Table- and the mean citation is **213**. The **SJR** indicator presents the average number of weighted citations received in the selected years by the documents published in IJMR journal in the three previous years. On the other hand **SNIP** measures contextual citation impact by weighting citations based on the total number of citations in a subject field. The **IPP** metric uses a citation window of three years which is considered to be the optimal time period to accurately measure citations in most subject fields. In case of IJMR the mean values of SJR, SNIP and IPP are 0.640, 1.378 and 1.175 respectively during the period of study.

6.0 Conclusion

The scientific and systematic study of IJMR journal literature in accordance with the objective of the study has revealed many the notable implications which are concluded below:

- The total research output comes to 156 that accounts for 86.7% of the total publications.

- The mean authorship is found to be 2.14 and degree of collaboration (DC) is **0.67** for MIS literature which indicates that the journal have accommodated more number of collaborative works over time.
- The sample data on authors productivity fits to the Lotka's generalized formula at $n = 4.03$. This is higher than what is proposed by Lotka ($n = 2$) because a large proportion of all authors (more than 75%) published only a single work.
- It is found that UK being the host country of the journal dominates others as 45.32% of authors affiliations belong to this country followed by USA and Australia with 10.27% and 9.06% affiliations respectively. Out of 28 affiliated countries, 17 countries only account for 8.46% of total author affiliation.
- It is observed that the Activity Index of USA and UK is above 100 in 5 different years during the study period while the AI of Rest of the World (RoW) follows the reverse trend. The AI scores indicate that USA and UK are not only the leader in MIS literature in terms of total output but also maintains the consistency in producing MIS literature over time followed by Australia and Canada.
- it is observed that UK, USA and Australia having more than average value of Domestic Collaborative Index ($DCI > 100$) while the ICI (International Collaborative Index) values of the rest of the productive countries show a reverse trend ($ICI > 100$).
- *Cranfield University* from UK tops the list among the most prolific institutions by 20 (6.04%) numbers of contributors but scoring 6.80 credit (rank 2) on the basis of equal credit method followed by *Queen's University* (Canada) with 13 numbers of contributors occupies the second rank while takes rank 3 by scoring 6.0.
- The major disciplines/schools from which contributions were made to MIS research are Management (100 contributors) and Business Administration (94 contributors). It is further observed that, top 10 ranked disciplines contribute as much as 75.5% authorship while rest 44 (81.5%) occasional disciplines contribute only 24.5%. Though the total output of MIS journal literature is highly influenced by contributors of number of disciplines/sub-disciplines but narrow downing further into their broad areas, it is observed that all most 91% of contributions are from *Management (65%), Computer Science & Information Technology (7%), Engineering (4%), Others (15%) while pure MIS having only 9% of total contributors.*
- The frequency distribution of both Subject Terms of IJMR journal literature follow Zipf's distribution. Further to bring more clarity on similarity of observed distribution against ideal distribution, exponential trend lines were drawn which exhibit similar behaviour to that of Zipfian curve.
- The mean length (pages) for articles is 22 and mean illustration per article is 2.3. The presence of charts (60%) and diagrams (38%) are prominent among all types of illustrations.

- As 80% of the articles having more than 20+ references in IJMR, it can be stated that the contributors of IJMR refer a good number of research papers while submitting their manuscripts.
- The steady growth rate of citation indicators (SJR, SNIP & IPP) shows the popularity, the quality as well as the high impact of IJMR publications. These indicators, not only helps editors to evaluate their journals with respect to others but also to the researchers, librarians and academic administrators to identify which are the core journals within the subject field.

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