

CONTENT ANALYSIS OF “ANNALS OF BIOMEDICAL ENGINEERING JOURNAL”

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Abstract

This paper attempts to highlights the quantitative assessment of status of the Journal by way of analyzing the various features of Journal “Annals of Biomedical Engineering”. During 2010-2014 a total of 1226 Articles were published in the Journal “Annals of Biomedical Engineering” by researchers in various countries.

Keywords: *Content analysis, authorship pattern. International collaboration, communication channel.*

Introduction

Content analysis is rapidly becoming less of a tool to be used in the experimental manipulation of the communication process. In these instances of experimental studies,

systematic changes in content are made and documented through content analysis, and the audiences are observed for the effects of these changes.

The specific role to be played by content analysis in organizing for recall the world's store of recorded knowledge. Content analysis appears to have two general and major functions. The first is to provide the descriptive abstract of any document at a level and of such a nature as will indicate what information may be found in it. The second is to provide guidelines in transforming document content from one medium to another and in reducing content for ease of bibliographic access.

The “Annals of Biomedical Engineering” is an international, peer-reviewed journal published monthly that aims to its readers with a unique forum for the exchange and sharing of information in social economics.

Objectives of the Study

The main objective of the study is to analyze the content of Journal of “Annals of Biomedical Engineering” and make the quantitative assessment of status of the Journal by way of analyzing the following features of Journal

1. To find out year-wise growth of publications,
2. To find out Geographical distribution of research output,
3. To find out the authorship and collaboration pattern in the publication,

4. To find out the extent of international collaboration,
5. To find out the most productive authors in the field,
6. To find out organization – wise distribution of publication,
7. To find out the channels of communications used by the scientists and
8. To find out the high frequency keywords appeared in the channels of communication.

Scope & Limitation of the Study

Scope of study is restricted to the “Annals of Biomedical Engineering” Journal published during 2010 to 2014. The papers presented in the Journal are analyzed using content analysis technique.

The present study is limited to the total numbers of 1226 papers published during 2010 to 2014.

Hypothesis of the Study

The study consists of following hypothesis:

1. Authorship trend is towards multiple authored papers.
2. USA is the high productive country.
3. Majority of the affiliated Institution are from USA.

Analyses of “Annals Of Biomedical Engineering Journal”

In views of the objectives of the present study, analysis of “Annals of Biomedical Engineering” is presented further (Annals of Biomedical Engineering, 2014).

Year-Wise Publication Productivity and Collaboration Rate

The word publication means the act of publishing .Productivity refers to measures of output from production processes, per unit of input. Collaboration is a recursive process where two or more people or organizations work together toward an intersection of common goals

Table 5.1: Year-Wise Publication Productivity and Collaboration Rate

Year	Single authored publication	Multi authored publication	Total no. of publication	Collaboration Rate
2010	10	304	314	0.97
2011	8	221	229	0.97
2012	10	215	225	0.96
2013	5	229	234	0.98
2014	6	218	224	0.97
Total	39	1187	1226	0.97

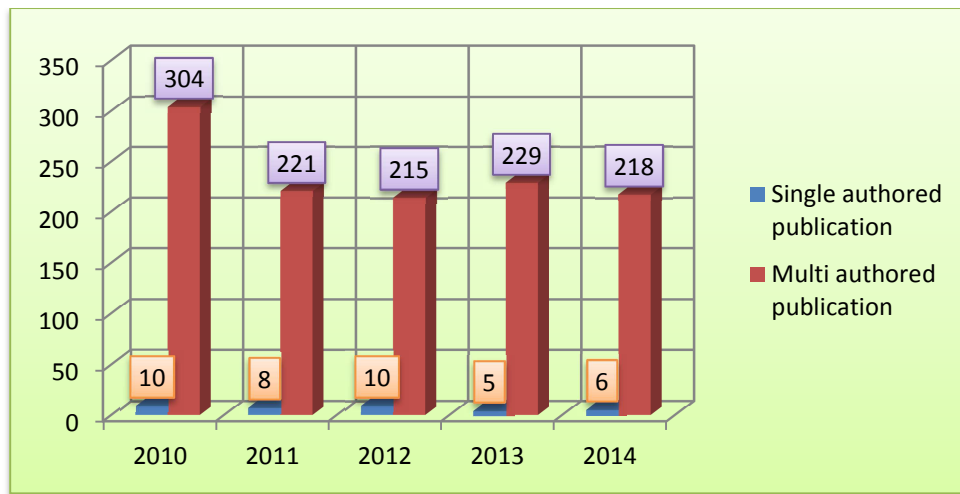


Figure 5.1: Year-Wise Publication Productivity and Collaboration Rate

It can be observed from Table No.3.1 & figure No. 3.1 that during 2010-2014 a total of 1226 Articles were published in the Annals of biomedical engineering by researchers in various countries.

Geographical Distribution of Research Output

Geographical distribution of research output means the article published from different countries. In political geography and international politics, a country is a political division of a geographical entity. Frequently, but not exclusively, a sovereign territory, the term is most commonly associated with the notions of both state and nation, and also with government.

Table 5.2: Country-Wise Distribution of Articles

Sr. No.	Country	Publication	%	Rank
1	USA	3271	57.79	1
2	China	335	5.92	2
3	Canada	213	3.76	3
4	UK	210	3.71	4
5	Germany	176	3.11	5
6	Italy	154	2.72	6
7	Spain	119	2.10	7
8	Japan	106	1.87	8
9	Ireland	101	1.78	9
10	Taiwan	96	1.70	10
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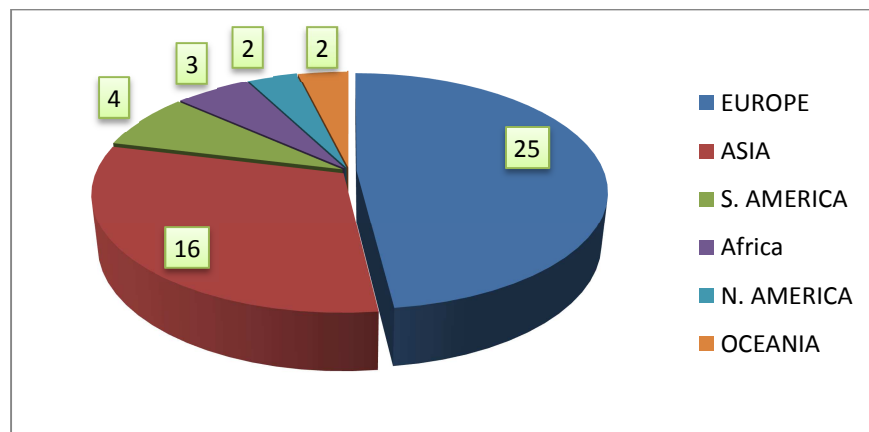


Figure 5.2: Country-Wise Distribution of Articles

It can be observed from Table No 3.2 and Figure No. 3.2 that, there were as many as 58 countries carrying out research and produced 5663 articles. Table no.2 provides ranked List of countries contributing to this field, the number of publications of each country and their share in percentages is the top producing country USA with 3271 publications (57.79) of the total output. Therefore, the hypothesis, **“USA is the high productive country” (Hypotheses No.2)** is valid. It can be stated that USA being the publishing country the output is more than other country.

Authorship and Collaboration Trend:

Gupta, D.K.⁽⁴⁾ Authorship is an observable phenomenon reflecting the contemporary scholarly practices clearly showing the communication, productivity and collaborative patterns and influences among researchers even though their quantities and qualities are not well understood.

Collaboration in research is said to have taken place when 2 or more persons work together on a scientific problem of project and effort, both physical and intellectual.

Table 5.3: Authorship and Collaboration Trend

Year	Single Author	Number of papers with various authorship								Total Publication
	1	2	3	4	5	6	7	8	more than eight	
2010	10	49	60	66	49	32	15	18	15	314
2011	8	32	41	38	28	35	20	12	15	229
2012	10	41	49	29	33	29	15	9	10	225
2013	5	29	32	46	44	32	17	16	13	234
2014	6	30	48	32	43	18	18	17	12	224
Total	39	181	230	211	197	146	85	72	65	1226
%	3.18	14.76	18.76	17.21	16.07	11.91	6.93	5.87	5.30	100.00

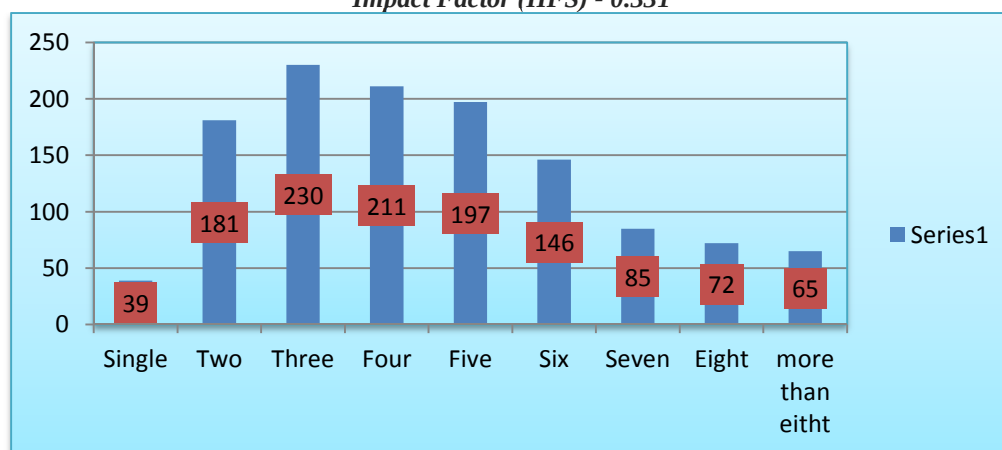


Figure No.5.3: Authorship and Collaboration Trend

It can be observed from Table No.3.3 and Figure No.3.3 that, year-wise authorship and collaboration trend is given in table 3. Authorship trend is towards multiple-authored papers. Single authored papers accounted for 39 (3.18%). **There fore, the hypothesis, “Authorship trend is towards multiple authored paper. (Hypothesis No.1) is valid.**

International Collaboration Pattern of Articles

The International collaborative production of articles is the simultaneous action of many people who try to combine their ideas to make a new one. In fact “collaborative” is the process where two or more people work together toward a common goal and they don’t required leadership.

Table 5.4: International Collaboration Pattern of Articles

No. of Countries			
Year	Single	Collaboration	Total No. of Publication
2010	263	51	314
2011	192	37	229
2012	188	37	225
2013	199	35	234
2014	189	35	224
Total	1031	195	1226
%	84.09	15.91	100.00

The distribution of the collaboration of the various countries and their institutions respectively are given in the further table.

Most Productive Author

An author is defined both as "the person who originates or gives existence to anything" and as "one who sets forth written statements" in the Oxford English Dictionary.^[24]

Table No.5.5: Most Productive Author

Sr. No.	Name Of Author	Country	Number Of Publication	Rank
1	Ajit P. Yoganathan	USA	13	1
2	Stefan M. Duma,	USA	8	2
3	Nicholas Stergiou	USA	8	2
4	Danny Bluestein	USA	8	2
5	Steven Rowson	USA	7	3
6	Shawn C. Shadden	USA	7	3
7	Michael S. Sacks	USA	7	3
8	Joel D. Stitzel	USA	7	3
9	Richard M. Greenwald	USA	6	4
10	Leo K. Cheng	New Zealand	6	4
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It can be observed from Table No. 3.6 that, the most productive authors are Ajit P. Yoganathan (USA) who had the highest number (13) of the publication. 3 Authors with 8 publications, 4 Authors with 7 publications, 6 Authors with 6 publications and 18 authors with 5 publication. Table gives a list of Authors appeared in the articles.

Institutes Wise Distribution of Articles Published

Institution is a society or organization for the promotion of science, education etc. ⁽⁵⁾

.An institute is a permanent organizational body created for a certain purpose. Often it is a research organization (research institution) created to do research on specific topics. An institute can also be a professional body. In some countries institutes can be part of a university or other institution of higher education, either as a group of departments or an autonomous educational institution without a classic full university status such as a University Institute.

Table 5.6: Institutes wise distribution of articles

Sr. No.	No. of the Institution	No. of Publication	Rank
1	Department of Biomedical Engineering, Duke University, Durham, NC, 27708, USA	20	1
2	Group of Structural Mechanics and Materials Modelling, Aragón Institute of Engineering Research (I3A), University of Zaragoza, 50018, Zaragoza, Spain	17	2
3	Stanford University Biodesign Program, Stanford University, 318 Campus Drive, Stanford, CA, 94305-5428, USA	16	3
4	Auckland Bioengineering Institute, University of Auckland, Private Bag 92019, Auckland, 1142, New Zealand	14	4
5	Department of Biomedical Engineering, Cornell University, Ithaca, NY, USA	13	5
6	Department of Biomedical Engineering, University of Michigan, Ann Arbor, MI, 48109, USA	13	5
7	Institute for Surgical Technology and Biomechanics, University of Bern, Stauffacherstrasse 78, CH-3014, Bern, Switzerland	13	5
8	Department of Biomedical Engineering, University of	12	6

	Virginia, P.O. Box 800759, Health System, Charlottesville, VA, 22908, USA		
9	Department of Biomedical Engineering, Worcester Polytechnic Institute, Worcester, MA, 01609-2280, USA	12	6
10	Department of Orthodontics and Dentofacial Orthopedics, Institute of Health Biosciences, The University of Tokushima Graduate School, 3-18-15 Kuramoto-cho, Tokushima, 770-8504, Japan	12	6
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It can be observed from Table No. 3.7 that, there were 5661 organizations involved in research activity. The organizations that have contributed in the publication during 2010-2014. Department of Biomedical Engineering, Duke University, Durham, NC, 27708, USA, 20 publication by one institutions, Group of Structural Mechanics and Materials Modeling, Aragón Institute of Engineering Research (I3A), University of Zaragoza, 50018, Zaragoza, Spain the list with 17 publication followed by one institutions. 14 institutions with 1 publications, 13 institutions with 3 publications, 12 institutions with 8 publications, 11 institutions with 5 publications, 10 institutions with 10 publications, 17 institution with 9 Publication, 18 institution with 8 Publication, 7 institution with 31 Publication, 67 institution with 6 Publication, 99 institution with 5 publication, 162 institution with 4 Publication, 320 institution with 3 Publication, 586 institution with 2 Publication, etc. and 1113 institutions with Single publication. Therefore the hypothesis **“Majority of the affiliated institution are from USA (Hypothesis No.3) is valid”**.

Distribution of Literature in Various Channels of Communication

Channel, in communications, refers to the medium used to convey information from a sender (or transmitter) to a receiver. Researchers communicated their publication through variety of communication channels.

Table 5.7: Distribution of literature in various Channels of Communication

Channels of Communication	No. of Publication	Percentage
Original Paper	1136	92.66
Erratum	21	1.71
Editorial Notes	20	1.63
Review Paper	18	1.47
Letter	8	0.65
News	7	0.57
Position Paper	6	0.49
Report	4	0.33
Editorial Notes	3	0.24
Retraction Note	1	0.08
Brief Communication	1	0.08
Editorial	1	0.08
Total	1226	100.00

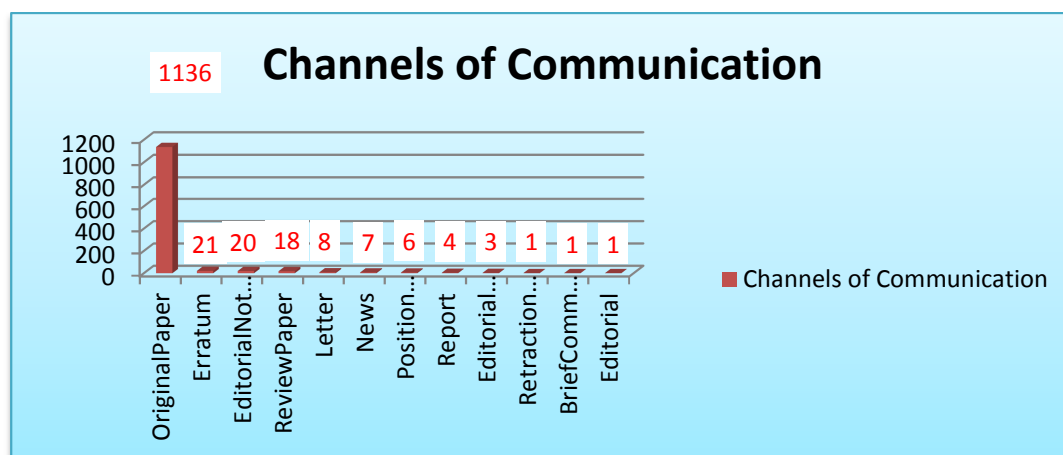


Figure No: 5.4 Distribution of literature in various Channels of Communication

It can be observed from table no. 3.8 and Figure No.3.4 that, 1136(92.66%) of the Literature was published in Original Paper followed by Erratum 21(1.71%), Editorial Notes 20(1.63%), Review Paper 18(1.47%), Letter 8(0.65%), News 7(0.57%), Position Paper 6(0.49%) Report 4(0.33%), Editorial Notes 3(0.24%), and Brief Communication, Retraction Note, Editorial 1(0.08%). The total content of Pharmaceutical Research that is Pharmaceutical steps recovery, Original Paper, Erratum, Editorial Notes, Review Paper, etc. is analyzed.

Distribution of Keywords

“A word occurring natural language text of documents or its surrogate that is considered significant for indexing and information retrieval”.⁽²⁾

Keywords are the words that are used to reveal the internal structure of an author's reasoning. Keywords are one of the best scientometric indicators to understand the grasp instantaneously the thought content of the articles and to find out the growth of the subject field. By analyzing the keywords appeared either on the title or article will help in knowing in which direction the knowledge grows.

“Keyword is a word that succinctly and accurately describes the subject discussed in a document”.⁽⁶⁾

Table No.5.8: Keywords

Sr. no	Keywords	Frequency	Percentage (%)	Rank
1	Tissue engineering	42	0.66	1
2	Biomechanics	41	0.64	2
3	Finite element modelling	30	0.47	3
4	Computational fluid dynamics	27	0.42	4
5	Finite element analysis	25	0.39	5
6	Hemodynamics	25	0.39	5
7	Shear stress	24	0.38	6
8	Atherosclerosis	22	0.35	7
9	Concussion	22	0.35	7
10	Mechanical properties	22	0.35	7
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It can be observed from Table No. 3.9 that, the high frequency keywords were Tissue engineering (42), Biomechanics (41), Finite element modeling (30), Computational fluid dynamics, (30) Table gives a list of keywords appeared in the articles.

Conclusion:

Annals of Biomedical Engineering is an interdisciplinary, international journal which presents original and review articles in the major fields of bioengineering and biomedical engineering. A major aim of bioengineering is to provide integrated approaches to the solutions of biological and biomedical problems. The philosophy is to provide engineering approaches to enhance the power of the scientific method, and to maintain a balance between experimental observation and quantitative analyses. While the development of theory and of mathematical models is strongly endorsed, these should be evaluated wherever possible using biological data from experiments that test specific hypotheses.

The Collaboration rates of articles published per year were 0.97. The highest numbers of Articles (314) were produced in 2010 and follower that 2013 respectively. There were as many as 53 countries carrying out research and produced 1226 articles. USA is the top producing country with 3271 publications (57.79) of the total output. Authorship trend is towards multiple-authored papers. Single authored papers accounted for 3.18 percent. Out of 1226 articles, 195 articles (15.91) are written in collaboration with International Institutions. The collaboration is observed with two countries and three countries. The most productive authors are Ajit P. Yoganathan (USA) who had the highest number (13) of the publication. There were 5661 organizations involved in research activity. The organizations that have contributed in the publication during 2010-2014, Department of Biomedical Engineering, Duke University, Durham, NC, 27708, USA, 20 publication by one institutions, Researchers

communicated their publication through variety of communication channels, the highest communication channels 1136(92.66%) of the Literature was published in Biotechnology.

Keywords are one of the best scientometric indicators to understand the grasp instantaneously the thought content of the articles and to find out the growth of the subject field. By analyzing the keywords appeared either on the title or article will help in knowing in which direction the knowledge grows .The high frequency keywords were Tissue engineering (42), Biomechanics (41), Finite element modelling (30), Computational fluid dynamics (30) Table gives a list of keywords appeared in the articles.

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