

# Indian Research Trends in Fashion Technology: A Study Based on Scopus Database

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(Received on 23 March 2014 and accepted on 24 April 2014)

**Abstract** - The paper portrays the results of a bibliometric analysis of Indian research publications in the field of fashion technology research during the period 1970-2013. It analyses 2,864 articles of Scopus database in the field of Fashion technology. It examines year wise distribution of articles, country wise distribution, languages distribution and bibliographic form of articles, doubling time, relative growth rate, high productive Institutes etc. inferences and findings are shown with relevant data analysis.

**Keywords:** Scientometrics, Fashion Technology, RGR and Doubling Time

## I. INTRODUCTION

Fashion in the narrow sense of the world means the changing form of clothing. These originate from peoples need to be adorned and admired but also allow the opportunity to enhance personal style or indicate a position in society. Fashion is not the only consideration in developing a garment for a market. The overall appearances as well as the utility value also have for fitness and purpose.

Fashion is a term that usually applied to a prevailing mode of expression, but quite often applies to a personal mode of expression that may or may not apply to all. Inherent in the term is the idea that the mode will change more quickly than the culture as a whole. The terms fashionable and unfashionable are employed to describe whether someone or something fits in with the current popular mode of expression. The term fashion is frequently used in a positive sense, as a synonym for glamour and style.

In this sense, fashions are a soft of communal art, through which a culture examines its notion of beauty and goodness. In this paper the extent of fashion in garment industry and its Indian research output in fashion technology has been attempted.

## II. LITERATURE REVIEW

Scientometrics has become a field in itself. (Beck (1984), Potter (1988), Van Raan (1996), Egghe and Rousseau (1990, 2012), Bruckner *et al* (1990), Glanzel (2003)). It provides relations between number of authors, number of publications, number of citations, funding, citations, number of journals, time intervals etc. (Chung and Cox (1990), Kealey (2000), Vitanov and Ausloos (2012), Ausloos (2013).

## III. METHODOLOGY AND DATA SOURCE

This study uses Scopus database for drawing publications data on Fashion technology. Scopus is an international multidisciplinary database indexing over 15000 international peer reviewed journals in science and technology, besides more than 500 international conference/seminar proceedings. The study uses 44 Years publications data from 1970 to 2013 on fashion technology. A total of 1,52,681 records were identified in the field of 'fashion technology'. Among this the Indian contributions works out to 4% of the total output. Nearly 2864 records thus collected data has been classified by using Excel software and the same has been loaded in to SPSS (Statistical Package for Social Sciences) for the purpose of analysis.

**IV. OBJECTIVES**

Objectives of the study are as follows:

1. To identify the Annual distribution and growth of Indian research on fashion technology research during the period 1970-2013
2. To identify the type of documents in the field of fashion technology.
3. To identify and analyse the country-wise collaboration of research output in the field of fashion technology.
4. To identify the languages of the output of publications.
5. To identify most high productive institutions on fashion technology
6. To compare and measure the growth rate of literature published in USA and India in relation to other countries.

**V. COLLECTION OF DATA**

For this study, the literature on fashion technology data has been downloaded from ‘Scopus’, multidisciplinary

online database, which is an international indexing and abstracting database, using the search term “Fashion Technology”. For this study, publications commencing from 1970-2013 (44 years) has been downloaded from the database. A total of 1,52,681 data has been identified. Out of 1,52,682 records, 2864 records pertaining to Indian contributions. The Indian contribution were analysed in this study.

The collected data has been classified by using Excel and the same was loaded in to SPSS (statistical package for social sciences) for the purpose of analysis. Statistical tools such as frequency distribution and percentage analysis and Scientometric techniques such as Authorship pattern, Relative Growth Rate (RGR), Doubling time (dt) citation analysis etc will be used for the study.

**VI. DATA ANALYSIS**

The countrywise distribution has identified and top 20 countries contribution were shown in Table I.

TABLE I COUNTRYWISE DISTRIBUTION

S.No.	COUNTRY	TP	%	∑ %	RoG(US)	RoG(IN)
1	United States	63829	41.81	41.81	1.00	22.29
2	United Kingdom	10239	6.71	48.52	0.16	3.58
3	Germany	9589	6.28	54.80	0.15	3.35
4	Japan	8448	5.53	60.33	0.13	2.95
5	Canada	7664	5.02	65.35	0.12	2.68
6	China	5355	3.51	68.86	0.08	1.87
7	Italy	5221	3.42	72.28	0.08	1.82
8	France	4674	3.06	75.34	0.07	1.63
9	Australia	3363	2.20	77.54	0.05	1.17
10	Netherlands	3146	2.06	79.60	0.05	1.10
11	India	2864	1.88	81.48	0.04	1.00
12	Spain	2633	1.72	83.20	0.04	0.92
13	Switzerland	2526	1.65	84.85	0.04	0.88
14	Sweden	2208	1.45	86.30	0.03	0.77
15	South Korea	1923	1.26	87.56	0.03	0.67
16	Taiwan	1483	0.97	88.53	0.02	0.52
17	Israel	1405	0.92	89.45	0.02	0.49
18	Brazil	1338	0.88	90.33	0.02	0.47
19	Belgium	1183	0.77	91.10	0.02	0.41
20	Austria	1057	0.69	91.79	0.02	0.37
21	Finland	1035	0.68	92.47	0.02	0.36
22	Others	11498	7.53	100.00	0.18	4.01
		152681	100		2.39	53.31

Nearly 55% of the outputs were provided by three countries such as USA, United Kingdom, and Germany. The top 21 countries provide nearly 92.47% of the total contribution in Fashion Technology Research. USA contributes nearly 41.81%. It is followed by United Kingdom

(6.71%) and Germany (6.28%). India stands Eleventh place with the contribution of 1.88%. The contributions were compared with USA as base country and the ratio of growth [RoG(US)] is also shown in Table 4. It can be seen that nearly 12 countries are providing nearly two times of

TABLE II YEARWISE DISTRIBUTION

S.No.	Year	Frequency	Percent	Cumulative Percent	RoG
1	1970	3	0.1	0.1	1.00
2	1971	4	0.1	0.2	1.33
3	1972	1	0	0.3	0.25
4	1973	4	0.1	0.4	4.00
5	1974	4	0.1	0.6	1.00
6	1975	4	0.1	0.7	1.00
7	1976	3	0.1	0.8	0.75
8	1977	5	0.2	1.0	1.67
9	1978	9	0.3	1.3	1.80
10	1979	5	0.2	1.5	0.56
11	1980	2	0.1	1.5	0.40
12	1981	10	0.3	1.9	5.00
13	1982	9	0.3	2.2	0.90
14	1983	13	0.5	2.7	1.44
15	1984	16	0.6	3.2	1.23
16	1985	17	0.6	3.8	1.06
17	1986	8	0.3	4.1	0.47
18	1987	17	0.6	4.7	2.13
19	1988	16	0.6	5.2	0.94
20	1989	8	0.3	5.5	0.50
21	1990	17	0.6	6.1	2.13
22	1991	13	0.5	6.6	0.76
23	1992	17	0.6	7.2	1.31
24	1993	22	0.8	7.9	1.29
25	1994	26	0.9	8.8	1.18
26	1995	29	1	9.8	1.12
27	1996	45	1.6	11.4	1.55
28	1997	46	1.6	13.0	1.02
29	1998	53	1.9	14.9	1.15
30	1999	67	2.3	17.2	1.26
31	2000	61	2.1	19.4	0.91
32	2001	70	2.4	21.8	1.15
33	2002	80	2.8	24.6	1.14
34	2003	108	3.8	28.4	1.35
35	2004	110	3.8	32.2	1.02
36	2005	124	4.3	36.5	1.13
37	2006	145	5.1	41.6	1.17
38	2007	180	6.3	47.9	1.24
39	2008	190	6.6	54.5	1.06
40	2009	203	7.1	61.6	1.07
41	2010	236	8.2	69.9	1.16
42	2011	287	10	79.9	1.22
43	2012	299	10.4	90.3	1.04
44	2013	277	9.7	100	0.93
	Total	2863	100		
	CAGR	11.10			

the contribution equivalent to USA. India contributes 4% of USA contributions. The contributions were compared with India as a base country and the ratio of growth [RoG (In)]. USA contributes 22.29 times of Indian contributions. The other eight countries are providing more than Indian contributions. UK, Germany and Canada provides three times of the Indian contributions. Canada, Italy and France provides twice that of Indian contributions.

The annual distribution and growth pattern of Indian research output on fashion technology articles during the period of 1970 to 2013 is shown in Table II. The ratio of growth (RoG) has been calculated with the present year publications divided by previous year publications. The ratio of growth (RoG) with each year is shown in table II.

The growth rate was measured with Compound Annual Growth Rate (CAGR)<sup>12</sup>. The mathematical formula of CAGR is

$$CAGR = \left( \frac{\text{Ending Value}}{\text{Beginning Value}} \right)^{\frac{1}{n-1}} - 1$$

The CAGR thus calculated has been shown in Table II.

In the year 1970 total number of publications in fashion technology is only 3. In the year 2013 it raised to 277. During the period 2008 to 2013 the average number of

publications in fashion technology is above 200. Their exist uniform and study growth of publication in Fashion Technology research year after year. Hence it can be stated that there exist a parabolic growth of publication output in the field of research of Fashion Technology. The RoG (Ratio of Growth) ranges between 0.25 and 4.00 . This indicates that the publications are in increasing.

The block year wise distribution has been shown in Table III. The RoG and CGAR thus calculated based on the formula said above, were also shown in table III.

During the first block period of 1970-1980 the number of publications was only 44. During the block year of 2003-2013 it raises to 2159. It can be inferred that the fashion technology research in Indian environment has been visualized only during the last decade ie. 2003 -2013.

The authorship pattern of Indian research output on fashion technology has been identified and the same is shown in Table IV.

Only 9.7% of contributions were by single author. It is followed by two authors (29.6%), three authors (23.9%) and five and above authors (20.4%). The collaborative research dominates in Fashion Technology research.

The comparative study has been carried out with block years and the same is shown in Table V.

TABLE III BLOCK YEAR

S.No.	Block year	Frequency	Percent	Cumulative Percent	CAGR
1	1970-1980	44	1.5	1.5	12.79
2	1981-1991	144	5.0	6.6	2.65
3	1992-2002	516	18.0	24.6	16.75
4	2003-2013	2159	75.4	100.0	9.87
	Total	2863	100.0		

TABLE IV AUTHORSHIP

S.No	Author pattern	Frequency	Percent	Cumulative Percent
1	Single author	278	9.7	9.7
2	Two authors	847	29.6	39.3
3	Three authors	684	23.9	63.2
4	Four authors	469	16.4	79.6
5	Five and above	585	20.4	100.0
	Total	2863	100.0	

The year wise authorship pattern has also been calculated and the same is shown in Table VI.

The relative growth rate (RGR) and doubling time (Dt) has been calculated and the same is shown in Table VII.

TABLE V BLOCK YEAR VS AUTHORSHI

S.No.	block year	Single author	Two authors	Three authors	Four authors	Five and above	Total
1	1970-1980	12 .4%	19 .7%	6 .2%	4 .1%	3 .1%	44 1.5%
2	1981-1991	23 .8%	63 2.2%	28 1.0%	21 .7%	9 .3%	144 5.0%
3	1992-2002	63 2.2%	170 5.9%	134 4.7%	75 2.6%	74 2.6%	516 18.0%
4	2003-2013	180 6.3%	595 20.8%	516 18.0%	369 12.9%	499 17.4%	2159 75.4%
Total		278 9.7%	847 29.6%	684 23.9%	469 16.4%	585 20.4%	2863 100.0%

TABLE VI YEAR VS AUTHORSHIP PATTERN

S.No.	YEAR	Single author	Two authors	Three authors	Four authors	Five and above	Total
1	1970	2 .1%	1 0	0 0	0 0	0 0	3 .1%
2	1971	1 0	2 .1%	0 0	0 0	1 0	4 .1%
3	1972	0 0	1 0	0 0	0 0	0 0	1 0
4	1973	0 0	2 .1%	0 0	2 .1%	0 0	4 .1%
5	1974	2 .1%	2 .1%	0 0	0 0	0 0	4 .1%
6	1975	2 .1%	2 .1%	0 0	0 0	0 0	4 .1%
7	1976	0 0	1 0	1 0	1 0	0 0	3 .1%
8	1977	2 .1%	2 .1%	1 0	0 0	0 0	5 .2%
9	1978	2 .1%	4 .1%	3 .1%	0 0	0 0	9 .3%
10	1979	1 0	1 0	1 0	0 0	2 .1%	5 .2%
11	1980	0 0	1 0	0 0	1 0	0 0	2 .1%
12	1981	1 0	6 .2%	3 .1%	0 0	0 0	10 .3%
13	1982	4 .1%	3 .1%	0 0	1 0	1 0	9 .3%
14	1983	3 .1%	5 .2%	2 .1%	1 0	2 .1%	13 .5%
15	1984	3 .1%	6 .2%	5 .2%	2 .1%	0 0	16 .6%
16	1985	7 .2%	5 .2%	2 .1%	3 .1%	0 0	17 .6%
17	1986	1 0	4 .1%	2 .1%	1 0	0 0	8 .3%
18	1987	0 0	10 .3%	4 .1%	2 .1%	1 0	17 .6%
19	1988	2 .1%	6 .2%	3 .1%	3 .1%	2 .1%	16 .6%
20	1989	0 0	3 .1%	1 0	3 .1%	1 0	8 .3%
21	1990	2 .1%	9 .3%	2 .1%	3 .1%	1 0	17 .6%
22	1991	0 0	6 .2%	4 .1%	2 .1%	1 0	13 .5%
23	1992	2 .1%	4 .1%	2 .1%	6 .2%	3 .1%	17 .6%

24	1993	1	7	4	5	5	22
		0	.2%	.1%	.2%	.2%	.8%
25	1994	4	8	10	2	2	26
		.1%	.3%	.3%	.1%	.1%	.9%
26	1995	1	11	7	5	5	29
		0	.4%	.2%	.2%	.2%	10
27	1996	7	16	9	7	6	45
		.2%	.6%	.3%	.2%	.2%	1.6%
28	1997	3	18	15	3	7	46
		.1%	.6%	.5%	.1%	.2%	1.6%
29	1998	6	21	10	12	4	53
		.2%	.7%	.3%	.4%	.1%	1.9%
30	1999	4	27	21	6	9	67
		.1%	.9%	.7%	.2%	.3%	2.3%
31	2000	11	23	17	8	2	61
		.4%	.8%	.6%	.3%	.1%	2.1%
32	2001	9	15	18	15	13	70
		.3%	.5%	.6%	.5%	.5%	2.4%
33	2002	15	20	21	6	18	80
		.5%	.7%	.7%	.2%	.6%	2.8%
34	2003	15	31	19	22	21	108
		.5%	1.1%	.7%	.8%	.7%	3.8%
35	2004	17	27	24	19	23	110
		.6%	.9%	.8%	.7%	.8%	3.8%
36	2005	18	32	24	15	35	124
		.6%	1.1%	.8%	.5%	1.2%	4.3%
37	2006	17	37	32	18	41	145
		.6%	1.3%	1.1%	.6%	1.4%	5.1%
38	2007	13	53	42	29	43	180
		.5%	1.9%	1.5%	10	1.5%	6.3%
39	2008	12	57	44	38	39	190
		.4%	20	1.5%	1.3%	1.4%	6.6%
40	2009	14	56	62	27	44	203
		.5%	20	2.2%	.9%	1.5%	7.1%
41	2010	19	64	65	47	41	236
		.7%	2.2%	2.3%	1.6%	1.4%	8.2%
42	2011	23	70	68	57	69	287
		.8%	2.4%	2.4%	20	2.4%	100
43	2012	21	90	67	49	72	299
		.7%	3.1%	2.3%	1.7%	2.5%	10.4%
44	2013	11	78	69	48	71	277
		.4%	2.7%	2.4%	1.7%	2.5%	9.7%
Total		278	847	684	469	585	2863
		9.7%	29.6%	23.9%	16.4%	20.4%	1000

From the table VII, it can be seen that the Relative Growth Rate (RGR) lies between 0.05 and 0.85 with the exception of initial year 1.10. Similarly the Doubling Time (Dt) lies between 0.82 and 14.90 with the exception of the initial year 0.63. The average ratio of growth is only 0.18. The average doubling time works out to 5.47 which indicates the articles doubles once in five and half years.

The top 10 authors contributions were shown in Table VIII. The table also shows number of articles, citations, number of authors, type of article and year of publications.

Butcher R J with 17 articles has the highest contribution with 160 citations. It is followed by Drew with 16 publications and Ghosh with 14 publications. Among the top 10 authors, highest number of citations can be seen in

the case of Drew, Bharadwaj and Ribas. These three authors have more than 270 citations.

## VII. FINDINGS

The findings of the study are

1. Nearly 55% of the outputs were provided by three countries such as USA, United Kingdom, and Germany. The top 21 countries provide nearly 92.47% of the total contribution in Fashion Technology Research. USA contributes nearly 41.81%. It is followed by United Kingdom (6.71%) and Germany (6.28%). India stands Eleventh place with the contribution of 1.88%.
2. 12 countries are providing nearly two times of the contribution equivalent to USA.

TABLE VII RGR AND DT

S.No	Year	Papers	Percent	Cumulative Percent	cum papers	w1	w2	RGR	Dt
1	1970	3	0.1	0.1	3		1.098612	1.10	0.63
2	1971	4	0.1	0.2	7	1.098612	1.94591	0.85	0.82
3	1972	1	0	0.3	8	1.94591	2.079442	0.13	5.19
4	1973	4	0.1	0.4	12	2.079442	2.484907	0.41	1.71
5	1974	4	0.1	0.6	16	2.484907	2.772589	0.29	2.41
6	1975	4	0.1	0.7	20	2.772589	2.995732	0.22	3.11
7	1976	3	0.1	0.8	23	2.995732	3.135494	0.14	4.96
8	1977	5	0.2	1.0	28	3.135494	3.332205	0.20	3.52
9	1978	9	0.3	1.3	37	3.332205	3.610918	0.28	2.49
10	1979	5	0.2	1.5	42	3.610918	3.73767	0.13	5.47
11	1980	2	0.1	1.5	44	3.73767	3.78419	0.05	14.90
12	1981	10	0.3	1.9	54	3.78419	3.988984	0.20	3.38
13	1982	9	0.3	2.2	63	3.988984	4.143135	0.15	4.50
14	1983	13	0.5	2.7	76	4.143135	4.330733	0.19	3.69
15	1984	16	0.6	3.2	92	4.330733	4.521789	0.19	3.63
16	1985	17	0.6	3.8	109	4.521789	4.691348	0.17	4.09
17	1986	8	0.3	4.1	117	4.691348	4.762174	0.07	9.78
18	1987	17	0.6	4.7	134	4.762174	4.89784	0.14	5.11
19	1988	16	0.6	5.2	150	4.89784	5.010635	0.11	6.14
20	1989	8	0.3	5.5	158	5.010635	5.062595	0.05	13.34
21	1990	17	0.6	6.1	175	5.062595	5.164786	0.10	6.78
22	1991	13	0.5	6.6	188	5.164786	5.236442	0.07	9.67
23	1992	17	0.6	7.2	205	5.236442	5.32301	0.09	8.01
24	1993	22	0.8	7.9	227	5.32301	5.42495	0.10	6.80
25	1994	26	0.9	8.8	253	5.42495	5.533389	0.11	6.39
26	1995	29	1	9.8	282	5.533389	5.641907	0.11	6.39
27	1996	45	1.6	11.4	327	5.641907	5.78996	0.15	4.68
28	1997	46	1.6	13.0	373	5.78996	5.921578	0.13	5.27
29	1998	53	1.9	14.9	426	5.921578	6.054439	0.13	5.22
30	1999	67	2.3	17.2	493	6.054439	6.200509	0.15	4.74
31	2000	61	2.1	19.4	554	6.200509	6.317165	0.12	5.94
32	2001	70	2.4	21.8	624	6.317165	6.43615	0.12	5.82
33	2002	80	2.8	24.6	704	6.43615	6.556778	0.12	5.74
34	2003	108	3.8	28.4	812	6.556778	6.6995	0.14	4.86
35	2004	110	3.8	32.2	922	6.6995	6.826545	0.13	5.45
36	2005	124	4.3	36.5	1046	6.826545	6.952729	0.13	5.49
37	2006	145	5.1	41.6	1191	6.952729	7.082549	0.13	5.34
38	2007	180	6.3	47.9	1371	7.082549	7.223296	0.14	4.92
39	2008	190	6.6	54.5	1561	7.223296	7.353082	0.13	5.34
40	2009	203	7.1	61.6	1764	7.353082	7.475339	0.12	5.67
41	2010	236	8.2	69.9	2000	7.475339	7.600902	0.13	5.52
42	2011	287	10	79.9	2287	7.600902	7.734996	0.13	5.17
43	2012	299	10.4	90.3	2586	7.734996	7.857868	0.12	5.64
44	2013	277	9.7	100	2863	7.857868	7.959625	0.10	6.81
	Total	2863	100					0.18	5.47

3. USA contributes 22.29 times of Indian contributions. The other eight countries are providing more than Indian contributions. UK, Germany and Canada provides three times of the Indian contributions. Canada, Italy and France provides twice that of Indian contributions.

4. In the year 1970 total number of publications in fashion technology is only 3. In the year 2013 it raised to 277. During the period 2008 to 2013 the average number of publications in fashion technology is above 200.





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