CHAPTER VII

FINDINGS AND RECOMMENDATIONS

INTRODUCTION

In this chapter, major findings of the study pertain to the literature in textile based on the analysis and interpretation presented in Chapter 6. The findings pertain to the comparison of the India and G7 countries and Indian contribution on textile literature that shows the impact of the literature growth.

DOCUMENT TYPES OF DISTRIBUTION OF TEXTILE RESEARCH

- The highest no. 1,641 with 74.7% is found in the article published in the journal paper in USA and the lowest number, only 1 is found in the articles published in the Note and Short Survey in CAN and CP in ITA of the same value. A large number of Journal Papers and Conference Proceedings are found in India and G7 Countries and lowest number can be traced to France and Italy. Notes in the CAN, Conference Proceeding in ITA and Story Survey in CAN are almost the same in number. The percentage ranges between 5.2 to 24.4. Journal papers have also a good place in all the documents types. The USA country has maximum numbers of Journal papers than other documents in the above tables. Numbers of journal papers documents have also increased during this period. The Conference Proceeding value is the highest in USA. The eight types of documents are of the highest value in USA. A maximum of 24.4% publications were from United States, followed UKD 1,128 and India occupies second position with a total production of 23.4% More than 39.5% of articles appeared from United States, India and UKD. 74.6% of publications are journal
articles, and 13.8% were conference papers. The scholarly communication of textile research output is mostly through journals and conferences.

**YEAR WISE DISTRIBUTION OF TEXTILE RESEARCH**

- The highest number of articles 682, 683, 684 and 675 in 2010 to 2013. The total number of lowest articles 458 and 491 are 2005 and 2015 respectively. A total of 9,000 records were covered in SCOPUS database for the period 2000-2015. The total output of textile research articles from 631 papers in the year 2000 to 458 papers in the year 2015. 5.7% of publications increase every year can be seen from 2009 onwards. Numbers of RGR (0.32) to (-0.08) have also increased during 2008 to 2015 respectively. Highest RGR (0.32) in 2010 is during the study. From 2000 till 2015, it shows hardly any change in the growth ratio of publications. There exists a fluctuation in RGR year wise. Since then it has decreased drastically and shows a fluctuation trend. A total of 9,000 records were covered in SCOPUS database for the period 2000-2015. The cumulative output of textile research from 631 papers in the year 2000 to 458 papers in the year 2015. 5% to 12% of publications increase every year can be seen from 2015 onwards. The ratio of growth works out 0.32 in 2010. There exists steep growth every year between 2010 and 2013. The growth ratio varies from (0.32) to (-0.08). From the year 2000 till 2010, it shows that hardly any change in the growth ratio of publications. There exists a fluctuation in GR by year wise. The year 2000 has noticed GR as (-0.12). Since then it has decreased drastically and shows a fluctuation trend. The year 2015 has seen GR as (-0.22). It is interesting to note that the GR in 2010 was 0.32 where as 2015 it has come down to (-0.22).
The highest numbers are found 2411 in fourth years block, it followed by 2340 in third years block, 2227 in first years block and 2022 in second years block. The highest value in fourth years block 2012-2015 and lowest value in second year block 2004-2007. The increase trend from 2004-2007. (Table 6.3). Only 24.7% of the publications were found during the first three block years i.e. 2000-2003. During the fourth block year it can be seen that 26.8% of publications appeared. A steep rise in the publication trend noticed from 2012-2015 onwards. 26% of textile publications can be seen during the period 2012-2015. In most of India and G7 countries, the growth of literature gaining momentum in first third or fourth block years and finds decline momentums in the remaining block year. It can be seen in the case of United States. The output reaches maximum in fourth block year i.e. 2012-2015 and finds declining momentum during the block period 2004-2007. This is evident in the case of United States, India, United Kingdom, Japan, Germany, France and Italy. In countries like United States, India and United Kingdom, it can be seen that nanotechnology is gaining momentum, in a study phase.

COUNTRY WISE DISTRIBUTION OF TEXTILE RESEARCH

The percentage range is found 5.2 to 24.4. The highest numbers of 2197 with 24.4% in USA and lowest numbers are found 471 with 5.2% in ITA. The near about percentage are found in USA and India respectively. The India has second position in this Table 6.4. From the years wise, the country of their origin can be identified in all types of materials like journals articles, books, reports etc. In many subject areas, USA publications are found to be used more heavily. Some of the user’s studies in India have shown that Indian publications are the second number. The second rank
goes to the publications from India 2111 with 23.5% and the third position goes to the publications from UKD 1128 with 12.5%.

- The Activity Index range are 61 to 195 in first year block 2000-2007 and 92 to 151 in second years block 2008-2015. The USA is the highest proportion i.e. 1133 with AI value 108 and 1064 with AI value of 92 in first and second year blocks during the period of 16 years. The total publications lowest were found during the first years block i.e. 2000-2007. During the second block, it can be seen that 4748 of publications appeared. A steep 937 rise in the publication trend noticed from 2004-2005 onwards. 70% of textile publications can be seen during the period 2000-2007. According to period usage of AI is increased but in the period its use is decreased. (Table 6.5). The Activity Index of United States during the period 2000-2007 is very high 108 but during the period 2008-2015 it seems to be 92. Overall the activity index during the period 2000-2007 is low compared to the period 2008-2015. Further it was observed that the Activity Index (AI) has reflected fluctuation trend during the study period (Fig. 6.5). There exists fluctuation in Activity Index during two block year’s period.

- The RCI ranges are from 0.5 to2.3 in India and G7 countries. The RCI is high value in ITA. The CPP ranges are from 7.5 to 23.9 in India and G7 countries. The same numbers are found RCI 1.3 in UKD and GER. The citation percentage are same in JPN, GER and FRA. The most cited country is USA 2197 (24%) with citations 16415 (17%). The second value of the publications from IND 2111 (23%) with citations 12101 (13%) and followed by third position goes to the publications from UKD 1128 (13%) with citations 15742 (16%), fourth position to the publications from CAN 956 (11%) with citations 10425 (11%), fifth position to the publications from
JPN 849 (9%) with citations 9661 (10%), GER publications 711 (8%) with citations 9880 (10%), FRA publications 577 (6%) with citations 10011 (10%) and ITA publications 471 (5%) with citations 11270 (12%). The highest number of articles i.e. 2197 (24%) in USA and lowest number of articles i.e. 471 (5%) in Italy respectively. The highest numbers are found in citation 16415 with 17 percentage in USA country and lowest 9661 with 10% in CAN.

PATTERN OF AUTHORSHIP AND COLLABORATION

- Highest numbers of single, double, triple author(s), fourth, fifth and sixth authors articles are 2008, 2348, 2068, 1120, 865 and 591 respectively. Numbers of single author articles are more than the number of triple author’s articles. On the other double authors articles are more than the single and triple authors articles. The CC ranges are from 0.38 to 0.61 during the period of 2000-2015 in authorship pattern. The same numbers of CC 0.52 in 2000, 2005, 2006 and 2007 respectively. Highest no. CC 0.61 in 2001 and lowest no of 0.40. The same numbers of CC 0.45 in 2009, 2010 and CC 0.43 in 2011, 2012 and CC 0.49 in the 2008 and 2013 respectively. Numbers of single author articles are more than the number of triple author’s articles. On the other double articles are more than single and triple authors articles. The authorship pattern of the article with the percentage in textile research Literature are grouped under different classes with six group authors, in the table above it is also observed that the researchers have not cited among articles published during 2009 and 2015. Among various types of authorship, single authorship is found to be very high 210 with 10.6%) in the textile literature. The Collaborative Coefficient for 2000 is 0.57. Collaborative coefficient is in decreasing trend in the year 2005, 2006 and 2007. This reveals that the sharing among the authors is not in grater probability.
The CAI values of single authors is higher more than double and sixth authors. The CAI value of single author higher more than double author in 2000-2007 in first block years. The CAI value of double author higher more than three author in 2008-2015 in second block years. The growth of second year blocks (99%). A steep rise in the publication trend noticed from 2008-2015 onwards. The highest value of CAI 1228 (130) in single author and lowest number of 202 (50%) in five authors in first-year block 2000-2007. The highest value of CAI 1156 (93) in double author and lowest number of 313 (99) in six authors in second year block 2008-2015. The textile publications can be seen during the period 2000-2015.

The CC ranges are from 0.45 to 0.75 in authorship pattern in India and G7 countries. Highest number of articles with 1142 in USA country in single author and lowest number of article with 9 in UKD in sixth author respectively. The same numbers of CC 0.69 in USA and UKD are respectively. The shows that there is no uniformity in the growth in the publication from various countries in the period from 2000-2015. The highest value in 4298 in single author and lowest value of 245 in sixth author pattern ship.

The highest number of 1133 with 109% or 1064 in USA in first 2000-2007 and 1064 with 92% in 2008-2015 years blocks and lowest number of 139 with 62% in ITA and 267 with 71% in 2008-2015 second years blocks. The growth of second years block 2008-2015. Table 6.10 shows that there is no uniformity in the growth in the publication from various countries in the period from 2000-2015. A steep rise in the publication trend noticed from 2008-2015 onwards.
SUB-DISCIPLINE DISTRIBUTION OF TEXTILE RESEARCH

- The highest percentage (25.1%) is found in the articles published on the topic ‘Textile Technology’ and the lowest percentage (5.1%) is found in the articles published on the topic ‘Environment Science’. This study shows that sub-filed according to decreases number of records during this study. The articles published on the topics ‘Polymers and Plastics and Management and Accounting are almost same 7.1% respectively. The result is near about percentage in this case. Almost near about number of articles on the topics Textile Industry and Textile Research are found in the above table i.e. 2151 and 2252 respectively. The growth increase trend from TF with 1060 numbers to TT 2252 numbers. The highest percentage (25.1%) is found in the articles published on the topic ‘Textile Research’ and the lowest percentage (5.1%) is found in the articles published on the topic ‘Environment Science in India and G7 countries.

- The highest value of (TT) 784 with AI value of 143 and lowest value of (ES) 119 with AI value of 105 in USA. The highest value of (TI) 552 with AI value of 109 and lowest value of (ME) 44 with AI value of 105 in IND. The highest value of (TI) 254 with AI value of 94 and lowest value of (ES) 41 with AI value of 71 in UKD. The highest value of (TI) 312 with AI value of 136 and lowest value of (ME) 9 with AI value of 16 in CAN. The highest value of (GI) 190 with AI value of 159 and lowest value of (ME) 16 with AI value of 38 in JPN. The highest value of (TT) 261 with AI value of 147 and lowest value of (ME) 16 with AI value of 38 in GER. The highest value of (TI) 245 with AI value of 177 and lowest value of (PP) 12 with AI value of 29 in FRA and the highest value of (TR) 146 with AI value of 124 and lowest value of 9 with AI value of 27) in India and G7 countries.
RESEARCH OUTPUT BY PERFORMING SECTOR

- The highest numbers are found of 4682 (52.1%) out of 9000 in Academic Institutions and lowest numbers are found 118 (1.3%) in Financial Institutions. The percentage ranges are from 1.3 to 52.1 in the above table. The growth trend in financial, technical, research and academic institutes.
- The highest number of other institutes are published 8376 (93.1%) out of 9000 total articles published. The RCI ranges are from 0.6 to 1.7 and CPP ranges are 8.2 to 19.8 and CPP ranges are found 6.3 to 19.8 during this period of 2000-2015. The near about numbers of RCI are GIT-United States and RWTH-Germany. The near about numbers of CPP are D.K.T.E-India, GIT-US, RWTH-German. The same case 0.4 % are found in IIT-Calcutta, IJT-Calcutta and D.K.T.E in Maharashtra. Almost percentage are same numbers of articles on published GIT-USA, RWTH-Germany and TITS-Bhiwani 24 (0.3%) are found in the table. The near about articles % are same 0.3 in PPIMT-Hissar, NIT-Jalandhar, GIT-US, RWTH-Germany and TITS-Bhiwani. Out of the total 9000 publications the top 14 institutions published 624 articles with 7213 citations with an average citation of 11.6 citations. NIT – Jalandhar has highest citation per paper i.e. 19.8 with a total number of publication is only 555. It is followed by NIRJAFT - Calcutta has 15.3 citations per paper with the publication of 21.

CITATIONS WISE OF DISTRIBUTION

- The highest numbers of 9978 citations are found in 6 to 10 ranking of citations and lowest 110 citations are found in 01 ranking of citations. The near about citations are found in 6 to 10 and 11 to 20. The highest numbers are found in citations more
than 100. The same value of percentage found in 71 to 80, 81 to 90 and 91 to 100. (Table 6.15)

- All the listed journals, highest h-index was for GG published from 471 articles with 4571 citations, Impact factor 4.6 with h-index 58 and lowest h-index was for TA published from 170 articles with 1670 citations and Impact factor 0.1 with h-index 12. The same value 119 in JJRATEU and TT journals, 199 in FIO and JTE.

- The CPP are found ranges are from 4.3 to 21.6 and RCI are found ranges from 0.41 to 2.03 in 2000-2015. The highest value of RCI 2.03 in 2005 and lowest value of 0.41 in 2005. The same value of RCI and CPP in 2001 and 2002 respectively. The year wise highest numbers are found 9892 with 10.4 in 2015 and lowest number 3241 with 3.4% in 2008. The citation range are from 3241 with 3.4% to 9892 with 10.4%. The same value of RCI 0.88 in 2001 and 2003.

**RANKING OF JOURNALS**

- The first rank and highest value of TRJ 1736 with 19.3%. It is followed by JTI 889 with 9.9%, TRJ 1736 with 19.3%, CFI 754 with 8.4%, IJFTR 728 with 8.1%, FP 578 with 6.4%, OFT 480 with 5.4%, GG 471 with 5.2%, JTA 448 with 4.9%, JFMM 397 with 4.4%, CTRJ 356 with 3.9%, FTEE 343 with 3.8%, JIT 281 with 3.2%, TOI 248 with 2.7%, IJCST 212 with 2.4%, FIO and JTE 199 with 2.2%, TA 170 with 1.9%, TH 151 with 1.6%, TTI 122 with 1.4%, JJRATEU and TT 119 with 1.3.
Indian Contribution on Textile Research

DOCUMENTS TYPES

- The number of papers are publishers India and International journals. The shows that maximum number of 1124 (53.2%) in journal papers and minimum number of 46 (2.2%) in short survey. The same nearest number is 48 (2.3%) and 2.2 in Short Survey and Erratum respectively. The shows that document types wise analysis of journal papers in reveals that the highest percent of are from conference proceeding with 26.5%, followed by editorial 111, with 5.3% and the reviews 104 with 4.9%. The remaining 4 variables, i.e. Notes, Short Survey and erratum contributed by 74 with 3.5%, 52 with 2.5%, 46 with 2.2% and 48 with 2.2%. 53.3% of Indian contributions are of journal papers, and 26.2% were conference papers. 20.6% publications only appeared in other bibliographic forms. 53.2% of Indian contributions are of journal articles, and 26.2% were conference papers. 22% publications only appeared in other bibliographic forms.

YEAR WISE OF DISTRIBUTION

- The pattern of Indian output during 2000-2015 is highly inconsistent. The numbers of papers published were highest in 2001. After that the number of papers published has declined and reached a lowest value (74) in the year 2013. However, the output has increased again in the year 2014 & 2015. The same is also reflected by the rate of growth. GR increased from the rate of 0.71 from the period 2005 to (-0.45) during the period 2004. The corresponding GR for different periods reduced from 0.04 during the period 2003 and 2009. India has contributed (3.36%) publications in textile literature during the period 2000-2015, with an average publication of 132 per
The cumulative output of textile in this field increased from 2 papers (8.9%) in the year 2014 to 182 papers (8.6%) in the year 2015. The growth ratio ranges from 0.67 to 2.37. The overall growth in textile as is evident during the period 2003-2010, is mirrored in the overall. This indicates that the awareness on textile research from the year 2014 onwards.

**SUBJECT WISE OF DISTRIBUTION**

- The highest no. of contribution Technical Fibers 723 (34.2%) and lowest no. of Polymers and Plastics 49 (2.3%) during the Indian contribution in this study. The number of percentage pertaining to various types of subjects like Environment Science, Garment Industry, Manufacturing Engineering, Management and Accounting, Polymers and Plastics, Technical Fibers, Textile Industry and Textile Technology. It is observed that journal literature comprised the highest percentage 723 (34.2%). The percentage from textile technology occupies the second highest position i.e. 512 (24.2%) followed by Garment Industry 410 (19.4%), textile industry 179 (8.5%), Management and Accounting 97 (4.6%), Manufacturing Engineering 78 (3.7%), Environment Science 63 (2.9%) and Polymers and Plastics 49 (2.3). This indicates that journals, Technical Fibers and Textile Technology publication are most preferred channels of information among research scholars in textile research. India has contributed (23.4%) publications in textile literature during the period 2000-2015. The cumulative output of textile in this field India role play the second position in India and G7 Countries. The eight subjects are mention in this table. The first number of subject value is technical fibers 723 with 34.2 percentage. It is followed by textile technology 512 with 24.2%, garment industry 410 with 19.4, textile industry 179 with
8.5, management and accounting 97 with 4.6%, manufacturing engineering 78 with 3.7%, environment science 63 with 2.9% and last polymers and plastics 49 with 2.3%.

**PATTERN AUTHORSHIPN OF DISTRIBUTION**

- Data presented in Table 7.4 indicates that the activity Index as well India was highly inconsistent during the period of study. Activity Index was highest in G7 countries value 118 in 2006 and lowest activity Index value 79 in 2015. It is observed from the above table that out of 2111 total articles in Indian and 6889 world G7 countries contributions. The total number of Indian activity index ranges are from 26 to 169 and World G7 countries activity index ranges are from 79 to 118. In Indian contribution of Activity Index (AI) was peek in 2015 (169) and the lowest in the year 2012 (26) and In World G7 contributions of Activity Index (AI) was peek in 2013 (116) and the lowest in the year 2015 (88.87). The India contribution 2111 out of 9000 total papers in 2000-2015. The Activity Index (AI) was peek in 2000 (102) in G7 countries. The highest in the year 2006 (118) and lowest in the year 2015 (79). The Activity Index (AI) was peek in 2000 (93) in India. The highest in the year 2015 (169) and the lowest in the year 2012 (26).

It is observed from analysis of articles by the numbers of author researches that the highest number of articles are published from two authored in India. Out of 6889 World G7 countries the highest value of contribution 1730 (25.1%) in single authors. Out of 2111 Indian contributions highest value of 727 (34.4%) in two authored and out of 6889 World G7 countries contribution 1621 (23.5%) in two authors. Out of 6889 World G7 countries contribution 1402 (20.3%) in triple authors and more than
triple 501 (23.72%) in India and 2136 (31%) in World G7 countries. The highest value 2636 in more than three authored India and G7 countries.

It is observed from analysis of CAI by the numbers of author researches that the highest number of CAI are from triple authors. In single author found CAI ranges are from 26 to 382. In double author found CAI ranges are from 43 to 258 and in multi authored CAI ranges from 49 to 220. In >4 mega authored ranges are from CAI 35 to 225.

PERFORMING SECTORS OF DISTRIBUTION

- The institutions ranges are from 1220 to 3282 during the period of 2000 to 2015. Out of 2111, the highest value of 1141 (54.1%) and out of 6889, the highest value of 2141 (31.1%) in others institutes. Out of 2111, the lowest value of 191 (9.1%) and out of 6889, the lowest value of 1029 (14.9%) in others institutes in India contributions.
- The value of RCI is high in the IIT-Delhi Institution value 3.5. RCI is very low in the other institutions. The average value of Citation Per Paper (CPP) is 11.75. The value of CPP is highest for the NIT-Jalandhar and the value of CPP is lower for the other institutions. The total of 2111 Indian contributions appeared in 21 journals which is one third of the total contribution. The IIT-Delhi has received the highest h index (142). The IIT-Delhi has published 142 articles with the citation of 1241. Hence it received the citation per paper is 8.7 and RCI is 1.5.

- RELATIVE CITATIONS OF DISTRIBUTION

- Table No. 7.9 depicts the year-wise (decade) distribution of journals. The analysis reveals that maximum TNC highest number 1124 with 9.3% in the year 2015 and lowest number 114 with 6.8% in the year 2005. The RCI ranges are from 0.14 to 2.36 during the period 2000-2015. The CPP ranges are from 0.8 to 13.5. The near
about numbers are found in TNP\% in 2006, 2007, 2008, 2009 and 2012. The same case near about value total number of percentage in 2014 and 2015. Out of 2111 articles with more than 12101 citations the articles published in Indian contribution during this study. The year wise distribution highest value of 210 with 9.9\% in 2001 and lowest value of 74 with 3.5\% in 2013. Out of 2111 top article 188 with 914 citations. The near about value of 111, 112 and 118 in 2007, 2008 and 2012. It is same case 141 and 144 in 2002 and 2005.

MOST PROLIFIC AUTHORS WITH CITATIONS IMPECTS

- The CPP range are from 5.3 to 31.9 and RCI value range are from 4 to 14. The near about h-Index numbers by author Goyal, A., and Ray, S.C. The h-index seems to be near about value 4 and 5 during the authors pattern ship Ray, S.C and Goyal, A. Similarly, It same case near about value 9, 10, 11, 12, 13 and 14 h-index is Tyagi, G.K, Teli, M.D, Chattopadhyay, R., Samanta, A.K., Ishtiaque, S.M. and Behera, B.K. It is found that India has 10 authors having published 235 and more contributions. This is followed by United States, Japan and Germany. Further the highest number of contributors 42 were by Behra, B.K, from India, followed by Teli, M.D., from India and Ishtiaque, S.M. India with 32 contributions. It is observed that although India country top in the production of textile research.

COLLABORATION INDIA AND G7 COUNTRIES

- India's publications are gradually increased year by year. The global publications share of India 2111 with 24.4. India has published 1002 (11.2\%) with international collaborative papers. The share of international collaborative papers in the Indian
research output was 11.2% during 2000-2015. The research output of India and International Collaborative papers of India. India has produced 2111 papers and received 12101 citations during the period 2000-2015. India was ranked 2nd among the India and G7 countries of the World in Textile research. As per the Scopus data, cumulative publications growth, the cumulative textile publications output of India and G7 countries. Out of 155 articles with more than 555 citations the articles published related to ‘Textile Research’ Journal received 95505 total citations with 9000 numbers of publications.

- **INDIAN INSTITUTIONS COLLABORATION INDIA AND G7 COUNTRIES**

- The first ranks of institution “IIT – Delhi” and top eleven ranks of “NIRJAFT – Calcutta” by above mention table. The research output of India and G7 countries collaboration with Institutions. The institutions published the highest number of papers 99 with 1.3 with ICP and only 43 papers are published with 3.0% by IIT – Delhi. The value of ICP (India and G7 countries) for institutions was also less than the Indian average. Among the institutions, Indian Institute of IIT all over India topped the output. IIT – Delhi, Mumbai, Roorkie and Calcutta all over institutions have the highest value.

**Ranking of the journals on textile research during the study period.**

**The highly productive country up to the eight ranks are as follows:**

- ‘USA’ with 2,197 contributions amounting to 24.4% of total contributions.
- ‘India’ with 2,111 contributions amounting to 23.5%. 

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• ‘UK’ with 1,128 contributions amounting to 12.5%.
• ‘Canada’ with 956 contributions amounting to 10.6%.
• ‘Japan’ with 849 contributions amounting to 9.4%.
• ‘Germany’ with 711 contributions amounting to 7.9%.
• ‘France’ with 477 contributions amounting to 6.4%.
• ‘Italy’ with 471 contributions amounting to 5.2%.
• In the next chapter the major findings based on the analysis are enumerated.

CONTRIBUTIONS OF THE STUDY

• The contributions of this study are:

• The inferences would help the decision makers to decide on the growth of collaborative research work in the field of textile research.

• Moreover, this study would also help to the countries to identify their position in the research activities in textile and take appropriate action to improve their position.

• This study would motivate the researchers who are already contributing in this field to actively engage in more research activities so that they could improve their status as an author as well as contribute more to the studies related to one of the worst global hazard.

Directions for Further Research

• The present study of research productivity on Textile offers avenues for further research on the following areas:
- The extent and pattern of collaboration research in the subfields of textile research.

- Mapping the literature on textile research.

- Impact of textile research literature on the branches of textile field

- The present research is based on the data available from SCOPUS Database.

  Research literature on textile is also published in journals that are not indexed in Web of Science. Hence further research can be carried out by including those journals also that appears in other databases like Web of Science Database, etc.