CHAPTER – V

FINDINGS, SUGGESTIONS AND CONCLUSION

This chapter describes the findings and conclusion of the present study titled, *Bibliometric Analysis of Research Performance of Bharathidasan University: A Case Study*. The records regarding the productivity of Doctoral Degrees, Publication of Articles, Books and Grants Received from various funding agencies were traced and collected.

The data was analysed using Bibliometric principles under various titles- Year wise and School wise Distribution and Annual Average Growth Rate of Ph.D awards, Subject cluster wise, Gender Ratio, Percentage and Growth Rate of Year wise and School wise Articles and Book Publications, Research Fellowship Received – ending with the application of Bradford’s Law.

A set of Hypotheses was formulated, validity tested and the objective of the study was fulfilled.

**Summary of Findings**

A total of 753 Ph.D awards, 219 book publications, 2750 articles in the National Journals, 333 articles in International journals and 25 Online Journals are credited to the 16 Schools under the Bharathidasan University between 1996 and 2010.
Ph.D Awards – Annual Average Growth Rate: 1996 to 2010

The productivity rate shows ups and downs over the fifteen years period. During some years the annual average growth rate is found to be positive while during some years it is negative.

The observed frequency reveals an overall average growth rate of 1.46. It is to be noted that the annual growth rate is more than one per cent.

School wise Distribution of Awards

There are 34 Departments in the university and these departments have been grouped under 16 Schools. Among the various schools, the School of Life Sciences ranks first with the productivity showing 27.36 per cent while the second rank goes to the School of Economics and Commerce & Financial Studies with a productivity of 14.08 percent. The School of Chemistry stands third with 12.35 per cent of the total productivity. The School of Education with 9.56 per cent ranks fourth, the School of Social Sciences with 8.1 per cent ranks fifth, School of English and other Foreign Languages with 7.3 per cent ranks sixth, the School of Physics with 6.11 per cent ranks seventh and the School Geo Sciences 5.44 per cent ranks eight. The score of all the other schools is found to be below the mark of five per cent while some of them stoop down below two per cent. The School of Indian Languages with 4.78 per cent comes under the below five per cent category and the rest, numbering seven are below two per cent.
School wise Growth Rate

School of Social Sciences

The growth rate is not found regular and there is rise and fall through the period of study of the 15 years. The growth rate is found to be positive during nine calendar years and negative during six calendar years. The average growth is 6.88 and the productivity is high in the year 2002.

School of Educations

The average growth rate of Ph.D awards in the school of Education is 10.46. It is revealed that there is no Ph.D output in the year 2003.

School of English and other Foreign Languages

The average growth rate is 0.79 and the maximum output is recorded in the year 2006. The average growth rate is an indication of a low research profile as it is less than one.

School of Indian Languages

On the whole there are 36 Ph.D awards and the year 2010 records the maximum of 10 awards. There is no output shown on five calendar years and with an average growth rate of 1.18 the output is minimum in almost all the academic years.
School of Chemistry

The average annual growth rate works out to be -0.25. The maximum awards is found to be in the year 2008 and the minimum during the years 1998, 1999 and 2003, while there is no productivity at all consecutively for three years from 2000 to 2002.

School of Computer Science and Engineering

At the present era which is considered to be the technically advanced era it is shocking to note that the output between 2004 and 2010 is miserable. There is productivity only in 2007 and 2010 with single Ph.D awards.

The above statistics clearly states that the Bharathidasan University has a long way to go in the field of Computer Science and Engineering.

School of Environmental Studies

A negative growth rate can be noticed from 2005 to 2007 with a maximum of three doctoral degrees in the year 2010. The overall growth rate is poor in the field of Environmental Studies which has gained momentum in the last few decades.

School of Geo Sciences

The Ph.D awards produced from the school is less in general and there is no productivity shown during two academic years. There seems to be a sustained increase from 2007 onwards which gives a futuristic hope for more productivity.
The average growth rate is 1.375 and the number of doctoral degrees are more than five only in two years that is 1996 and 2010.

**School of Life Sciences**

A look at the Ph.D awards in the School of Life Sciences that ranks first among the 16 Schools reveals a growth rate of 1.82. There is a gradual increase and consistency and the output shows a healthy trend over the fifteen years of study. It is happy to note that in 2007 the output reached its zenith with as maximum as 33 awards.

**School of Marine Sciences**

The School of Marine Sciences which is yet to gain momentum shows the growth rate of 3.25. The output is very less that is less than five during all the years of study. The maximum growth rate is 3.00 recorded in the year 2009.

**School of Mathematics**

The School of Mathematics gives a negative output though mathematics remains an ever green subject from time immemorial. Of the fifteen years there is no productivity at all in eight calendar years and the overall output for a period of fifteen years is only eight. The average growth rate of this department is in negative that is -4.30.
School of Physics

The average growth rate of Ph.D awards in the School of Physics is found to be 5.23. There is very low output in the year 2002 and a negative production is shown in the years 2005 and 2010.

Bharathidasan Institute of Management

The School has produced Ph.D awards in a very minimal number that is 10. It is found that the growth rate is nil during 10 calendar years. The highest output is in the year 2009 and the average growth rate is a mere 0.71 which is less than one.

Subject Cluster wise Frequency Distribution of Ph.D Awards

It is found that the Faculty of Science and Engineering records a lead over the other three clusters. The research output of Ph.D awards in this school alone forms more than 50 per cent. Second in the order is the Faculty of Arts followed by the Faculty of Indian and other Languages and the Faculty of Management. From the overall picture it can also be inferred that laboratory subjects maintain a lead over the non laboratory subjects.

Gender Ratio

It is a known fact that in our country the male literacy rate is always higher than the female literacy rate and Bharathidasan University is no exception. The male Ph.D awardees are more in number than the female awardees.
In the Faculty of Arts, of the 239 awardees, the male awardees constitute 56.49 per cent and the female awardees constitute 43.51 per cent which shows that there is no significant domination of male over female awardees.

As in the Faculty of Arts, in the Faculty of Indian and other Languages also there is not much a significant difference between the male and female awardees. 54.95 per cent productivity belongs to the male category with 45.05 per cent to the female category which gives more are less equal contribution.

However there is a wide difference between the male and female awardees in the Faculty of Science, Engineering and Technology. The output from the female category is only 28.09 per cent whereas in the male category it is 71.91 per cent.

In the Faculty of Management in which the overall performance itself is very low, the productivity from the female category is also very low with a ratio of 9:1 male and female categories.

**Productivity of Publications**

**Correlation between Research Productivity and Publications**

It is found that out of the total 3327 publications 15.66 per cent has been published in the year 2010 which marks the maximum followed by 15.66 per cent in the year 2009. The lowest output is marked in the year 1999 with 3.64 per cent.
In order to check the correlation between the total research productivity and the total publications, the correlation coefficient of the two variables is worked out.

The Pearson’s coefficient is 0.9006 which is positive and shows a strong correlation. It is inferred that as the number of Ph.D awards increases the number of publications also increases.

**Correlation between Research Productivity and Publications in National Journals**

It is inferred from the statistics that the year 2010 marks the maximum number of publications with 14.51 per cent followed by 14.15 per cent in the year 2009 and the minimum is recorded during the year 1999. The Pearson’s correlation coefficient is 0.906 that shows a positive correlation. This shows that the number of Ph.D awards and the total number of articles published in National journals are highly associated. The discipline wise data shows that the Faculty of Science and Engineering Technology ranks first regarding research publications. The Faculty of Arts ranks second and this is followed by the Faculty of Indian and other Languages and then the Faculty of Management. It can also be inferred that preference is given to publications in National journals over preference in foreign journals.
Correlation between Research Productivity and Publications in International Journals

The highest number of publications is recorded in the year 2010 with 26.73 per cent and the lowest 1.80 per cent in the year 1997. It is highly satisfactory to note that the number of International publications is increasing year after year. The Pearson’s coefficient of the number of research productivity and the number of publications in International journals has a positive association ($r= .641$) though when compared to that of National level is very low. The discipline wise statistics gives the same ranking as that of the National publications. The Faculty of Science and Engineering Technology ranks first with a sustained output during all the fifteen years of study followed by the Faculty of Arts that shows no productivity during five calendar years and then by the Faculty of Indian and other Languages with the Faculty of Management in the fourth place.

Correlation between Research Productivity and Publications in Online Journals

The advent of Information and Technology revolution made it possible to go for publications in online other than print media. The growth rate is 2.53 and this tends to increase due to the drastic change in the advancement of technology.

Pearson’s coefficient shows that, with the advent of technological advancement online publications gained momentum in the recent years and as for
as Bharathidasan University is concerned there is a healthy sign and the correlation is 0.830 which shows a highly positive significance.

The discipline wise statistics shows that the school of Science and Engineering continues to top the rank with five publications consecutively for the last three years followed by the Faculty of Arts. BIM has produced one whereas the productivity from Indian and other Languages is nil.

**Correlation between Research Productivity and Publication of Books**

The statistics regarding the number of books published from 1996 to 2010 reveals that the year 2006 stands first with 14.61 per cent followed by 13.24 per cent in the year 2007 and with the lowest 1.83 per cent in the year 1998. Though the growth rate is haphazard the productivity is good all through the years.

It is found that the maximum number of books published is in the year 2006 and the minimum number of books is published in the year 1998. The Pearson’s Correlation coefficient is 0.473 that brings out a negative significance.

The discipline wise publication of books reiterates the fact that BIM has a long way to go as far as publications are concerned. The productivity of Science, Engineering and Technology is good and the Faculty of Arts and Indian and other Languages should increase the number of publications to keep them on par with the Faculty of Science, Engineering and Technology.
Projects and Grants Received

The statistics regarding the total number of projects produced in a particular year and the grants received, the maximum output is in the year 2009 with 56 degrees and the grants received is the highest in the year 2008.

With regard to the grants received the highest amount is received from the Rajiv Gandhi Fellowship for the SC/ST followed by CSIR-JRF/SRF and UGC research fellowship for meritorious students respectively. The total grant received from 2004 to 2012 amounts 1002.23 lakhs.

The grants received from the University Research Fellowship amount to 85.93 lakhs with 137 beneficiaries. The scholarship received from the State Government for the Most Backward Class is 71.51 lakhs and the student beneficiaries are 2275. The scholarship under the State Government Backward Class scholarship is Rs.118.25 lakhs with 4015 student beneficiaries. With a grant of Rs 366.26 lakhs, 8967 students were benefitted under the SC/ST scholarship.

The University has received grants for projects from the DST and UGC for the maximum of 67 times followed by DPT with 25 times and CSIR with 15 times during the years from 1996 to 2010. The number of times the grants received from various funding agencies is 181 and the maximum grant of Rs.2,15,46,000 is received in the year 2010 and the minimum grant of Rs. 95,000 is recorded in the year 2001.
Productivity of Ph.D awards and Bradford’s Law of Scattering

In order to check the Bradford’s Law the doctoral degree awards that totals 753 is divided into three zones, each zone containing equal years that is five years each. The three zones are in the ratio of 163: 189: 401:: 1:1.59:2.460 which does not befit into the formula 1:n:n^2 and hence does not corroborate with Bradford’s Law.

Productivity of Publications and Bradford’s Law of Scattering

In order to check the Bradford’s Law the total number of publications 3327 is divided into three Zones, each zone containing equal years that is five years each. The three zones are in the ratios of 585:922:1404:: 1: 1.576:2.4 (1:n:n^2, 2.41) which befits in to the formula 1:n:n^2 and hence corroborates with Bradford’s Law.

Productivity of Publications in National Journals and Bradford’s Law of Scattering

In order to check the Bradford’s Law the total number of national publications 2750 is divided into three Zones, each zone containing equal years that is five years each. The three zones are in the ratios of 474:782:1494:: 1:1.650:3.15 which befits in to the formula 1:n:n^2 and hence corroborates with Bradford’s Law.
Productivity of Publications in International Journals and Bradford’s Law of Scattering

In order to check the Bradford’s Law the total number of International publications 333 is divided into three Zones, each zone containing equal years that is five years each. The three zones are in the ratios of 65:74:194:: 1:1.138:2.984(1.29) which does not befit into the formula 1:n:n^2 and hence does not corroborate with Bradford’s Law.

Books Productivity and Bradford’s Law of Scattering

In order to check the Bradford’s Law the total number of Book publications 219 is divided into three Zones, each zone containing equal years that is five years each. The three zones are in the ratios of 46:64:109:: 1:1.391:2.36 which does not befit into the formula 1:n:n^2 and hence does not corroborate with Bradford’s Law.

One-Way ANOVA Test Results

The different faculty with regard to awards, it is found from the application of One – Way ANOVA test that there is a significant difference between number of years and number of Ph.D awards as the calculated value is <0.05. Of the 14 Schools there is no significant difference between the number of years and the number of Ph.D awards in 11 schools whereas a significant difference is shown in three schools. The not significant schools consist of History (.289>0.05), Education (.287>0.05), English and Other Languages (.175>0.05), Indian Languages Tamil (.380>0.05), Chemistry (.134>0.05), Computer Science
The significant schools consist of Economics and Commerce (0.039<0.05), Life Sciences (0.027<0.05), and Marine Sciences (0.006<0.05).

**Clusters of Faculty with Various Parameters**

The total period of study of 15 years from 1996 to 2010 has been divided further into three groups each group consisting a period of five years. A cluster wise analysis for a period of 15 years is made applying the one –way ANOVA test. The result shows that the cluster of Science has more awards followed by Arts and the cluster of Languages shows a very less significance whereas there is no significance shown in the cluster of Management. The year wise as well as the overall output is high in the cluster of Science when compared to the other two.

**Awards**

It is found from the results that there is a gradual increase between groups but there is doubledup productivity in the third stage between 2006 and 2010. The observed difference from the test is significant with 0.000<0.05 which shows that there is a significant difference between number of years and number of awards.

**Grants**

With regard to grants towards research, the calculated value is less than the table value that is 0.013<0.05 which shows that there is significant difference
between number of years and number of grants. The grant received is at the highest in the third group during 2006 to 2010.

**Guides**

There is significant difference between number of years and number of guides as the calculated value is .000 which is less than the table value 0.05.

**Correlation Results of Different Parameters in 15 Years**

From the Mean, Standard deviation and correlation value for the selected three variables for the period of 15 years covering all the schools of Bharathidasan University it is found that an average of 50 Ph.Ds are awarded under 66 Guides with a grant of 40 lakhs. It is found that the number of Ph.D awards is positively associated with the number of guides \( (r= .887) \) and grant amount \( (r=.741) \). It is revealed that with more number of guides and with a good amount of grants the productivity of awards naturally tends to increase.

The subject wise mean, standard deviation and correlation values reveal that the number of Ph.D awards is positively related with the number of guides.

**Correlation among Variables for Group I (1996 to 2000)**

The output from various cluster schools as well as the overall research output, number of guides and the amount of grant for the first five years is analysed under Group I taking into account the years from 1996 to 2000.
The mean, standard deviation and correlation values for the selected variables show that on an average 33 Ph.Ds are produced under 26 research guides with the grant of 11 lakhs.

The number of Ph.D awards is positively related with the number of guides; for Arts $r = .781$, for Languages $r = .457$, for Science, Engineering and Technology $r = .655$ and for BIM $r = .137$ and the awards are also positively associated with the grants received; $r = .639$ for Arts, $r = .194$ for Languages, $r = .642$ for Science and $r = .258$ for BIM respectively.

**Correlation among Variables for Group II (2001 to 2005)**

The mean, standard deviation and correlation for the four cluster schools along with the awards, grants and guides for Group II give the statistics of 38 Ph.Ds under the guidance of 49 guides with the grants amounting to 23 lakhs. There is no positive relation between the number of guides and the number of awards: for Arts $r = -.561$ for Languages $r = .569$, for Science, Engineering and Technology $r = .257$ and for BIM $r = -.629$. No significance is shown in the relationship between the grants received and the award: for Arts $r = -.272$, for Languages $r = .354$, for Science, Engineering and Technology $r = -.102$ and BIM $r = -.839$. 
Correlation among Variables for Group III (2006 to 2010)

The mean, standard deviations and correlation for the four cluster schools along with the awards, grants and guides for Group III shows that the number of Ph.D awards is positively associated with the guides in the Arts and Languages schools where as there is no significant association in the Schools of Science and Engineering and BIM. For Arts $r = .741$ for Languages $r = -.528$, for Science and Engineering $r = .005$ and for BIM $r = .356$. There is significant association between the grants received and the awards: for Arts $r = .382$, for Languages $r = -.761$, for Science and Engineering $r = .284$ and BIM $r = .454$.

Test Result for Hypotheses

**Hypotheses I**

There is significant growth in academic research output from faculties of various schools of Bharathidasan University and hence ‘Hypotheses I’ proved positive.

**Hypotheses II**

There is significant difference between number of years and their number of Ph.D awards and hence ‘Hypotheses II’ proved positive.

**Hypotheses III**

There is significant difference between number of years and their number of grants and hence ‘Hypotheses III’ proved positive.
Hypothesis IV

There is significant difference between number of years and their number of guides and hence ‘Hypotheses IV’ proved positive.

Hypothesis V

There is a correlation between the productivity of Ph.D completions and publications of research scholars and hence ‘Hypotheses V’ proved positive.

Hypothesis VI

A difference is noticed in the research performance between male and female candidates. The number of awards to the male candidates are more than that of the female candidates and hence ‘Hypotheses VI’ proved positive.

Hypothesis VII

There is significant difference between the research output of Life Sciences compared to the other three clusters and hence ‘Hypotheses VII’ proved positive.

Suggestions

[1]. Similar studies can be carried out for other Universities in Tamil Nadu as well as at the national level.

[2]. A study of similar title can be carried out by making a comparison of two Universities.

[3]. A Study of similar kind can be carried out among the affiliated colleges of Bharathidasan University as well as other Universities.
[4]. Databases regarding research productivity should be created, maintained and made available to research scholars.

[5]. The created databases should be digitalized and made available in the general library of the university for the sake of easy accessibility by the scholars.

[6]. Vibrant functioning of research journal should be ensured by the university in order to accommodate the publications of scholars and faculty members.

**Conclusion**

The analysis aimed at analysing the research productivity of Bharathidasan University through the 16 Schools for over a period of 15 years reveals that the growth rate was not steady through the period of study. All the schools though cannot be expected to display uniformity in growth aspects should have continuity in maintaining the research productivity. The results of individual schools show that some schools are not regular in producing a positive growth and some remain without any productivity in between years.

It is also found that the performance of School of Performing Arts and Biomedical Sciences is nil. Major research output is shown in the School of Life Sciences.
The gender ratio in relation to Ph.D output shows that, in general, numerical strength of women is found to be lesser than that of the men scholars. The school of Management is very weak in women strength with the ratio of 9:1.

Regarding publications, publications in Indian journals are found to be more than in International Journals. The Online publications started gaining momentum in the last decade and maintained sustainability since then. The university’s regulation that a minimum of two articles shall be published in a reputed journal before the submission of the doctoral thesis has contributed to a greater extent towards the increase of publications.

A study on the funds received from the external sources shows that with the increase in the funds received there is an equal increase in the research productivity.

This study is a record of bibliography of doctoral dissertations generated between 1996 and 2010 and can serve as a reference tool at the university library. The study also produced compilation of journal articles output in to a bibliography providing a consolidated display of the same. The results of this study report can serve as a basic guide to scholars who may intend to take up a similar study.

This study would be of significance because in the absence of any norms and standards it is difficult to compare the results of the performance of an institution. If the nation is to succeed as a great technological power with
knowledge based economy, world class universities are required. The UGC and the Government of India are in the process of chalking out plans to elevate the status of higher education to the international level. The first step to attain this purpose is to examine the problems of research productivity and create realistic solutions.

In an article published in *The Business Line* titled “Indian’s sub-standard engineering colleges”, the facts given though are about the engineering colleges it is obviously applicable for arts and science colleges also. It is stated that “The world’s top 50 universities in engineering and technology in 2013 do not include any Indian university / college. The Higher Education World Reputation Ranking 2013 of top 100 institutions has representation from all the BRIC countries, except India. We can conveniently blame it on bias, or simply ignore the global ranking. While the Government – run institutions have their share of challenges, the private institutes/universities, perceived to be a ray of hope, appear to be less interested in improving quality”. It has also stated that “… to provide a clear road – map for the students with an inclination for research to pursue their interest…In the advanced countries, research work is given high priority among the engineering colleges/universities. The teachers can lead by example and inspire students to pursue research and innovation” (Krishna Kumar. G, 2013).
The article clearly points out the present scenario and stresses on the fact that promotion of research activities at the higher education level is the need of the hour.

The document titled “Quality Ph.Ds” submitted by the National Knowledge Commission says that “The growth in the number of doctorates has only been 20 per cent in India in the period 1991 to 2001 compared to 85 per cent in China. Not more than one per cent of those completing higher education opt for doctoral studies in India and a substantial number of students prefer to go abroad. To address this problem there is a pressing need for urgent government policy interventions, including high priority initiative to attract, nurture and retain the countries’ best young minds in academia and research”. India shall definitely record its mark on the international research map and Bharathidasan University shall continue to contribute its share to attain the goal.