International Journal of Multidisciplinary Research and Development
Online ISSN: 2349-4182, Print ISSN: 2349-5979, Impact Factor: RJIF 5.72
www.allsubjectjournal.com
Volume 3; Issue 5; May 2016; Page No. 254-258

Research output in the faculty of engineering & technology

Guru Nanak Dev University, Amritsar: An Analytical Study of Doctoral Theses

[1] Naresh Nandan, [2] Dr. Kulvir Kaur

[1] System Manager, Bhai Gurdas Library, Guru Nanak Dev University, Amritsar, Punjab, India
[2] Assistant Librarian, Bhai Gurdas Library, Guru Nanak Dev University, Amritsar, Punjab, India

Abstract
This paper reports the analysis of doctoral theses awarded in the Faculty of Engineering & Technology, at the Guru Nanak Dev University, Amritsar in the fields of Computer Science & Engineering and Electronics Technology. The distribution of Ph.D. theses is analyzed during the period of 1985-2014. There are 40 doctoral degrees awarded during the study period in the Faculty of Engineering and Technology. The data related to research growth and development are analyzed under 12 heads viz., department-wise distribution of theses, chronological analysis of theses, gender-wise analysis of research scholars and research guides, guide-wise productivity, top ranking of research guides in both the departments, guide-ship pattern of doctoral theses, page-wise distribution of theses and average number of pages per thesis, length of number of citations and average number of citations per thesis. The study found that the time span 2006-2010 is the most productive years with the awarding of 15 (37.5%) doctoral degrees and there is a gradual growth of research output in Computer Science & Engineering and Electronics Technology fields. It is also observed that 13 research guides are presently engaged in guiding doctoral students.

Keywords: Research Output, Doctoral Theses, Computer Science & Engineering, Electronics Technology, Guru Nanak Dev University.

1. Introduction

The main function of university has been defined as the discovery of knowledge and its transmission from one generation to the next. Faculty members of the universities in India have two functions to perform that is teaching and research. In other words, universities produce knowledge through research and transmit it via the formation of graduates and postgraduates and the publication of research results.

The research output is one of the indicators which determine the development of a country in terms of PCI (Per Capita Income), GNP (Gross National Product), GDP (Gross Domestic Product) and the life standard of people. Therefore, research output depends upon R&D expenditure, government policies, private agencies, universities and institutions (Meera and Sahu, 2014 [1]. In India, universities and institutions are playing a significant role in the R&D and the research output in universities is gaining importance for the past few decades. In recent decades computer science and engineering research is becoming an increasingly international endeavour. In view to the growth and development of research, an attempt has been made here to trace the research output of Computer Science & Engineering and Electronics Technology departments of Guru Nanak Dev University (G.N.D.U.), Amritsar since the inception of the departments.

2. Guru Nanak Dev University

Guru Nanak Dev University [2] was established at Amritsar on November 24, 1969 to mark the 500th birth anniversary of Guru Nanak Dev Ji. During the eventful history of 46 years, the university has scaled new heights in achieving excellence in academic, sports and cultural activities. The University has attained the highest status of University with Potential for Excellence (UPE) which is the highest status awarded by the University Grants Commission (UGC). With this rare honour, the University has become one of the best 6 universities in India and become the only university in Punjab to acquire this status. At present, the university has 13 faculties and 37 departments of teaching and research. The Faculty of Engineering & Technology includes Computer Science & Engineering and Electronics Technology departments. Since the Computer Engineering & Technology department has included in this faculty in 2015. Therefore, the study limits to only two departments i.e. Computer Science & Engineering (now Computer Science) and Electronics Technology.

2.1 Department of Computer Science & Engineering

Computer Science & Engineering is an inter-disciplinary subject having direct applications in diverse areas. The department of Computer Science & Engineering (computer science & applications till 1994), was established in the year 1988. Recently in the year 2015, the department has further divided into two departments i.e. Computer Engineering & Technology and Computer Sciences on the basis of the nature of the programmes.

2.2 Department of Electronics Technology

The department of Electronics Technology [3] was formally established in 1983 to cater to the requirements of developing electronics industry in the state of Punjab as well as in the rest of India and the research programme has been in operation since the inception of the department.

Analysis of doctoral theses conducted by universities clearly indicates the direction in which, a specific subject field is moving. It also indicates the thrust areas of research that call for attention from the researchers.

3. Review of Literature

Ravi and others (2007) [4] investigated the doctoral studies in the faculty of science at Annamalai University, Annamalai in the fields of marine biology, physics, chemistry, botany, zoology, biochemistry, mathematics, statistics and geology during the period of 2001-2005. The study found that marine biology (24.79%) had the greatest number of theses and the statistics (1.28%) were observed as the lowest number of theses.

Kumbar and Raju N. (2008) [5] conducted a study to trace the research productivity in library and information science based on Ph.D. theses submitted to various Indian universities since 1957 and classified them viz., decade-wise growth, university-wise distributions, state-wise distributions, subject-wise distributions and guide-wise ranking of Ph.D. theses. The study found that the subjects like Bibliometrics/ Scientometric/Informetrics analysis (64 doctoral degrees) were the favourite subjects among the professionals.

Bala and Gupta (2009) [6] examined the growth and impact of research output of Government Medical College & Hospital (GMCH), Chandigarh during 1992-2007. The study found that GMCH stood at 9th rank in research output, 13th in average citation per paper and 12th in h-index among the top 15 medical colleges of the country. The study further found that out of 754 papers, 125 papers (16.58%) involved national collaboration and only 18 papers (2.39%) involved international collaboration.

Another study on library and information science research in India was carried out by Chandrashekara and Ramasesh (2009) [7] and depicted the quantum of research output in the form of doctoral theses state-wise, university-wise, topic-wise and supervisor-wise.

Mulla and Konnur (2010) [8] investigated the doctoral theses awarded by Bangalore University and reported the growth and development of research activities of past $4^{1/2}$ decades from 1963-2005 in 38 domains. The study revealed that on an average 34 doctoral theses were being awarded and from 1990-2002 the research output traced significance with 1002 (66.93%) doctoral theses being awarded. The study further revealed that the maximum research was carried out in Zoology (149, 9.95%) and Botany (133, 8.88%) departments. It is observed that 737 research supervisors were engaged in guiding doctoral students.

Again Mulla and Konnur (2012) [9] analyzed the growth and development of research activities in Visvesvaraya Technological University from 2007-2011 in 8 engineering and allied domains. The study found that on an average 50 doctoral degrees were being awarded in a year. From 2010 and 2011 the research output traced significant growth with the awarding of 156 (62.40%) doctoral degrees. It was also observed that 169 research supervisors were engaged in guiding doctoral students.

Thavamani and Pushparaj (2012) [10] analyzed the research output in library and information science in the universities in western states of India. The study found that among the western states, Maharashtra had more research output and among the subjects, academic libraries (33.33%) were most preferred by the candidates than any other.

Mahajan and Chauhan (2013) [11] reported the trends of research in Indian universities with respect to production of number of Ph.D.s. The study found that more than half (52%) of the doctoral research work in Indian universities was being done in the areas of science and technology. Collectively social sciences and humanities subjects were holding 48% of the total Ph.D. production. The state-wise data depicted that Andhra Pradesh was the top state which awarded 11.2% of the total Ph.D.s of the country whereas subject-wise trend analyzed that language and literature was the most productive subject area which accommodated 25% of the total number of Ph.D.s produced in the country followed by Engineering and Technology with 18% and 16% by Biology and Medical Sciences which broadly categorized as Life Sciences.

Kulvir Kaur (2014) [12] focused the research output of social sciences in Indian Universities during the years 2012 and 2013 using data from 'University News' under the column of list of Ph.D. notifications. The study found that the highest number of students awarded the doctorate degrees were in Education and the lowest in Tourism during 2012 and 2013.

Parameswaran (2015) [13] presented the growth and contribution of the research carried out by the researchers of Anna University using data from Web of Science online database for a period of 34 years from 1980-2013. The study found that there was a gradual growth of publications during 1980-2013. The annual average research output was 67 records whereas the research output of the researchers is fairly collaborative.

4. Source Data

The study is based on 40 theses which are submitted to the departments of Computer Science & Engineering and Electronics Technology, Guru Nanak Dev University, Amritsar since the inception of the departments and are available at Bhai Gurdas Library of the University.

5. Reasons for Selecting the Topic

- To compile bibliographic directory of research in Computer Science & Engineering and Electronics Technology departments;
- To avoid duplication of research work; and
- To provide reference tool for further research by the scholars of Computer Science & Engineering and Electronics Technology departments.

6. Objectives of the Study

The objectives of the study are:

- To examine the quantum of research output in the Faculty of Engineering & Technology submitted to Guru Nanak Dev University, Amritsar during the study period;
- To know the chronological distribution of theses;
- To find out the gender-wise submission of theses;
- To study the productivity of guides in the selected disciplines;
- To find out the gender-wise distribution of supervisors;
- To find out the top ranking of research guides in both the departments;
- To study the guide-ship pattern in field of Computer Science and Electronics Technology departments;
- To know the page-wise distribution of theses and average number of pages per thesis; and
- To know the length of number of citations and average number of citations.

7. Methodology

The data for the present study has been collected from the library and 40 theses belonged to the faculty of Engineering &

Technology from the years 1985 to 2014 were used in data collection. A total of 40 bibliographic records were collected, organized, tabulated, calculated, analyzed and presented by using simple arithmetic and statistical methods, in order to arrive for the results.

8. Data Analysis and Interpretation

Table 1: Department-wise Distribution of Ph.D. Theses

Department	Subject Code	Number of Ph.D. Theses	%
Computer Science & Engineering	C. S. E.	20	50%
Electronics Technology	E. T.	20	50%
Total		40	100

Table 1 shows department-wise productivity of doctoral theses. In total, 40 doctoral degrees are awarded in the faculty of Engineering & Technology, with 20 (50%) theses in each department.

Table 2: Chronological Analysis of Ph.D. Theses

Years (Block-wise)	C. S. E.	E.T.	Total
Before 1996	-	1 (5%)	1 (2.5%)
1996-2000	-	3 (15%)	3 (7.5%)
2001-2005	2 (10%)	5 (25%)	7 (17.5%)
2006-2010	8 (40%)	7 (35%)	15 (37.5%)
2011-2014	10 (50%)	4 (20%)	14 (35%)
Total	20 (100)	20 (100)	40 (100)

Table 2 shows the chronological distribution of Ph.D. theses and the study covers the time span under the blocks of five years in which time span 2006-2010 is the most productive years having 15(37.5%) theses, followed by 2011-2014 years which include 14 (35%) theses and 2001-2005 years include 7 (17.5%) theses. The department-wise analysis shows that it differs and found that the growth rate of theses in C. S. E. department is high (50%) in 2011-2014 years whereas in E.T. department it is high (50%) in time span of 2006-2010 years. It is interesting to note that not even a single Ph. D. is submitted before 2001 in C. S. E. department whereas in the years 1986-1995 in E. T. department.

Table 3: Gender-wise Analysis of Research Scholars

Gender	C. S. E.	E. T.	Total
Male	14 (70%)	13 (65%)	27 (67.5%)
Female	6 (30%)	7 (35%)	13 (32.5%)
Total	20 (100)	20 (100)	40 (100)

The gender-wise study, in table 3, reveals that male scholars (67.5%) are dominant in research work in both the departments as compare to female scholars, who constitute 32.5% only. The department-wise analysis shows that 70% male scholars of the C. S. E. department and 65% of the E.T. department are awarded Ph.D. during the study period. Among the female scholars, the E.T. department is produced 35% and C. S. E. department 30% theses in the university.

Table 4: Department-wise Productivity of Guides

Department	No. of Guides	No. of Ph.D. Theses
C. S. E.	6	20
E. T.	7	20
Total	13	40

Table 4 indicates that 13 guides have guided 40 Ph.D. scholars. The study further indicates that the productivity rates for the research scholars in both the departments are higher than the guides. The theses having two or more guides are considered under the first guide.

Table 5: Gender-wise Analysis of Research Guides

Gender	C. S. E.	E. T.	Total
Male	6 (100%)	6 (85.71%)	12 (92.31%)
Female	-	1 (14.29%)	1 (7.69%)
Total	6 (100)	7 (100)	13 (100)

Table 5 indicates that 12 (92.31%) male guides and only 1 (7.69%) female guide have guided 40 Ph.D. scholars. The table clearly indicates that all the research guides are male supervisors in C. S. E. department whereas more research guides i.e. 6 (85.71%) are male research guides in E. T. department as compare to female research guide i.e. only 1 (14.19%).

Table 6: Most Productive Guides in Computer Science& Engineering

S. No.	Guide	No. of Theses	Rank
1	Gurvinder Singh	3 (15%)	3
2	Hardeep Singh	5 (25%)	2
3	Kahlon, K. S.	7 (35%)	1
4	Kawaljeet Singh	1 (5%)	4
5	Sood, Sandeep Kumar	1 (5%)	4
6	Surjit Singh	3 (15%)	3
Total		20 (100)	

Table 6 shows guide-wise distribution of Ph.D. theses in C. S. E. department. The table clearly indicates that as many as 20 theses have been submitted under the guidance of 6 guides. The maximum output is 7 (35%) by Dr. Kahlon, K. S. followed by Dr. Hardeep Singh who has guided 5 (25%) research scholars, Dr. Surjit Singh and Dr. Gurvinder Singh with 3 each (15%) and others with one research scholar each (5%).

Table 7: Most Productive Guides in Electronics Technology

S. No.	Guide	No. of Theses	Rank
1	Bindra, Sukhleen	4 (20%)	2
2	Derick, Engles	3 (15%)	3
3	Hudiara, I. S.	5 (25%)	1
4	Jasvir Singh	1 (5%)	5
5	M. L. Singh	4 (20%)	2
6	Malik, S. S.	1 (5%)	5
7	Sohal, J. S.	2 (10%)	4
Total		20 (100)	

Table 7 shows the distribution of research guidance in E.T. department. The table clearly indicates that as many as 20 theses have been submitted under the guidance of 7 guides. It is found that the most active guide is Dr. Hudiara, I. S. who has guided 5 (25%) research scholars followed by Dr. Bindra, Sukhleen and Dr. M. L. Singh with 4 each (20%), Dr. Derick Engles with 3 (15%) and Dr. Sohal, J. S. with 2 (10%) research scholars whereas Dr. Jasvir Singh and Dr. Malik, S. S. have equally guided one each (5%).

Table 8: Guide-ship pattern of Ph.D. Theses

No. of Guides	C. S. E.	E. T.	Total
1	15 (75%)	12 (60%)	27 (67.5%)
2	5 (25%)	7 (35%)	12 (30%)
3	-	1 (5%)	1 (2.5%)
Total	20 (100)	20 (100)	40 (100)

Table 8 shows the guide-ship pattern of Ph.D. theses in both the departments. The table reveals that nearly 68% of the scholars have a single guide while 30% of the scholars have double guides. The department-wise analysis shows that the maximum number of scholars i.e. 15 (75%) in C. S. E. and 12 (60%) in E.T. have a single guide whereas more E.T. scholars i.e. 7 (35%) have double guides as compared to C. S. E. scholars i.e. 5(25%). It is further found that only one scholar in E.T. department has 3 guides. It indicates that joint guide-ship is not common in the faculty of Engineering & Technology in the G.N.D.U.

Table 9: Page-wise Distribution of Ph.D. Theses

Pages	C. S. E.	E. T.	Total
Less than 100	-	-	-
101-150	4 (20%)	7 (35%)	11 (27.5%)
151-200	10 (50%)	10 (50%)	20 (50%)
201-250	3 (15%)	3 (15%)	6 (15%)
251-300	2 (10%)	-	2 (5%)
More than 300	1 (5%)	-	1 (2.5%)
Total	20 (100)	20 (100)	40 (100)

Table 9 shows that the maximum number of theses i.e. 20 (50%) have pages in the range of 150-200 followed by 11 (27.5%) with less than 150 pages, 6 (15%) with the range of 201-250 pages and 2 (5%) with 251-300 pages. Only one thesis has more than 300 pages. The department-wise analysis shows that equal number of theses in both departments i.e. 10 each (50%) and 3 each (15%) have pages in the range of 151-200 and the range of 201-250 pages respectively. It is also found that there is not a single thesis in E.T. department having pages more than 250.

Table 10: Average Number of Pages per Thesis

Department	Number of Theses	Total Pages	Average
C. S. E.	20	3373	168.7
E. T.	20	2327	116.4
Total	40	5700	142.5

Table 10 represents the average number of pages per thesis in both the departments (142.5%). It is clear from the analysis that the average number of pages per thesis in C. S. E. department is calculated to be 168.7 and in E. T. 116.4.

Table 11: Length of Number of Citations in Ph.D. Theses

Length	C. S. E.	E. T.	Total
Less than 100	2 (10%)	6 (30%)	8 (20%)
101-150	6 (30%)	7 (35%)	13 (32.5%)
151-200	5 (25%)	5 (25%)	10 (25%)
201-250	5 (25%)	2 (10%)	7 (17.5%)
251-300	1 (5%)	-	1 (2.5%)
More than 300	1 (5%)	-	1 (2.5%)
Total	20 (100)	20 (100)	40 (100)

Table 11 shows the data on the length of citations of Ph.D. theses. The maximum number of theses i.e. 13 (32.5%) in both the departments have citations in the range of 101-150, and citations in the range of 251-300 and more than 300 constitute only one thesis each. The table also shows that the maximum number of Ph.D. theses in E.T. (35%) and C.S.E. (30%) have length of citation in the range of 101-150. It is interesting to note that there is not a single thesis having citations more than 250 in E. T. department.

Table 12: Average Number of Citations per Thesis

Department	No. of Theses	Total Citations	Average
C. S. E.	20	3383	169.15
E. T.	20	2545	127.25
Total	40	5928	148.2

Table 12 represents the average number of citations per thesis in both the departments. It is clear from the analysis that the average number of citations per thesis in C. S. E. department and E.T. department is calculated to be 169.15 and 127.25 respectively during the period of study.

9. Findings

- The time span 2006-2010 is the most productive years having 15 (37.5%) theses in both the departments.
- The male scholars (67.5%) are dominant in research work in both the departments as compare to female scholars (32.5%).
- 13 guides have guided 40 research scholars in both the departments whereas the productivity rates for the research scholars in both the departments are higher than the guides.
- All the research guides in C. S. E. are male, while 6 out of the 7 research guides in E. T. department are male.
- Out of the 6 guides in the C. S. E. department, Dr. Kahlon, K. S. is the one who has guided more candidates i.e. 7 (35%) whereas in E. T. department Dr. Hudiara, I. S. has guided more candidates i.e. 5 (25%).
- 27 (67.5%) scholars have a single guide, 12 (30%) have double guides and one research scholar has three guides.
- A maximum number of theses i.e. 20 (50%) have pages in the range of 151-200 whereas 11 (27.5%) theses have pages in the range of 101-150 and only one of the thesis has more than 300 pages.
- The average number of pages per thesis in both the departments is found to be 142.5.
- 13 (32.5%) theses have constituted in the range of 101-150 citations in both the departments and on an average number of citations per thesis in C. S. E. and E. T. is 169.15 and 127.25 respectively.

10. Conclusion

The present study has been carried out to analyze the research output and the doctoral degrees awarded in two departments in faculty of Engineering & Technology since the inception of the departments. The study found that 40 degrees are awarded in the faculty of Engineering & Technology by the Guru Nanak Dev University, Amritsar during 1985-2014. The authors carefully analyze the details of doctoral degrees awarded in the faculty of Engineering & Technology. It is observed that the time span 2006-2010 is the most productive years having 15 (37.5%) theses in both the departments and productivity rates

for the research scholars in both the departments are higher than the guides. It has been observed that altogether 13 supervising guides are identified during the study period. Dr. Kahlon, K. S., from C. S. E. department and Dr. Hudiara, I. S. of E. T. department has guided the maximum number of doctoral theses i.e. 7 (35%) and 5 (25%) respectively. An average number of pages per thesis is 142.5 in the faculty of Engineering & Technology whereas average number of citations per thesis is 148.2. This analysis can serve as a platform to provide an over view of the doctoral research in field of Engineering & Technology. This study led to increase the research output at various in-depth applied researches in future.

References

1. Meera Sahu SK. Research output of University College of Medical Science, University of Delhi: A bibliometric study. COLLNET Journal of Scientometrics and Information Management, 2014; 8(2):401-418.
2. Guru Nanak Dev University, Amritsar. http://gndu.ac.in.
3. Annual Report Guru Nanak Dev University, Amritsar, 2012.
4. Ravi S, Mohan V, Srinivasaragavan P. Doctoral studies in faculty of science in Annamalai University. ILA Bulletin, 2007; 43(1):33-40.
5. Kumbar M, Raju NV. Research productivity in library and information science in India during 1957-2006. SRELS Journal of Information Management, 2008; 45(1):71-80.
6. Bala A, Gupta BM. Growth and impact of research output of Government Medical College & Hospital, Chandigarh: A case study. Annals of Library and Information Studies, 2009; 56(2):86-94.
7. Chandrashekara M, Ramasesh CP. Library and information science research in India. In International Conference Papers of Asia Pacific Conference on Library and Information Education and Practice. http://www.slis.tsukuba.ac.jp/a-liep2009/proceedings/Papers/a65.pdf (accessed on 20 May, 2016), 2009, 530-537.
8. Mulla KR, Konnur PV. Research activities of Bangalore University (1963-2005): A bibliometric study. Indian Journal of Interdisciplinary Research, 2010; 1(2):24-30.
9. Mulla KR, Konnur PV. Research activities in Vesvesvaraya Technological University: An analytical study. International Journal of Information Dissemination and Technology, 2012; 2(2):92-99.
10. Thavamani K, Pushparaj A. Research output in library and information science in India: An analysis of doctoral dissertations from universities in the Western States. Kelpro Bulletin, 2012; 16(2)48-55.
11. Mahajan P, Chauhan SK. Research output of Indian universities: Observations and key issues. International Journal of Information Dissertation and Technology, 2013; 3(1):22-26.
12. Kulvir Kaur. Social sciences research output in Indian Universities: An assessment. In H.S. Chopra (Ed.), Information technology tools and technique in social science research, proceedings of National Seminar held on Guru Nanak Dev University, Amritsar New Delhi, Shree Publishers & Distributors, 2014; 2:128-132.
13. Parameswaran R. Research output of Anna University: A scientometric study. Knowledge Librarian, 2015; 2(2):85-100.