PhD Profile

An Insight

PILOT STUDY ON THE CAREER PROFILE AND PROFESSIONAL ACHIEVEMENT OF THE PHDS IN SCIENCE FROM SELECTED UNIVERSITIES/INSTITUTES OF INDIA

Catalyzed and Sponsored by : National Science and Technology Management Information System (NSTMIS) Division, Dept.of Science & Technology (DST), Govt. of India.

Prepared by : Natural Resources India Foundation (NRIF), New Delhi

Introduction

❖ Key technologies of the 21st century are driven by science-based innovations.

❖ Highly qualified manpower comprising of doctorates or post-doctorates in science and engineering institutions is one of the key inputs for science-based innovations, identified by many research studies and reports such as: *Science & Engineering Indicators, NSS, World Science Report, European Science Report, OECD countries are prominently cited in this regard.*

❖ Therefore, the NSTMIS Division, DST, GoI, felt it important to review the characteristics of the PhD degree in science faculty from the selected institutes of the country and their absorption in the national and international stream. This work was assigned to **Natural Resources India Foundation (NRIF)**. **NRIF** made an attempt to establish benchmarks to compile their characteristics through generation of data from the selected institutions of repute and also obtained the details of out-turn in terms of quantity and quality of doctorates.

❖ The Department attaches great importance to this study as the outcome is expected to be of immense help to the Government / industry / academic institutions, policy makers and planners in the country. The findings of this study were also presented and discussed at the UNESCO conference held during last week of November 2005, and organized by DST, GoI, at New Delhi.

❖ The Department is thankful to **NRIF,** Project Investigator, Mr. R P Mattoo, and

NRIF Team for their sincere efforts and, timely completion of the study.

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Objectives

The study covered the following objectives :-

i. To prepare detailed profile of PhD's by various science disciplines / sub-discipline, gender, enrollment, entry-level qualifications / input requirements, scholarship / funding support, outturn, time taken, etc.

ii. To determine the factors that facilitated researchers / thesis supervisors in the PhD research programs and / or the Constraints faced by the scholars during their PhD programme.

iii. To study the career profile, professional achievement of PhDs, their present status in R&D and / or whether the PhDs are having closer linkages with demands of the industry;

iv. Pattern of absorption in India and to identify the number of PhD's who have and /or are moving abroad;

Education System

India has one of the largest 'Higher Education System' in the world. It has **18** Central Universities **(CUs)**; **195** State Universities **(SUs)**; 89 Institutes Deemed to be Universities **(Dmd Us)**; **05** Institutes established under State Legislative Act; **13** Institutes of National Importance **(IoNI)** and, 16,885 colleges.

Scope of the Study

*25 selected Universities / Institutes were targeted comprising: **Nine** (9) Central Universities; **Ten** (10) Institutes of National Importance; **Two** (2) Institutes Deemed to be Universities; and **Four** (4) State Universities.*

Approach

The study was approached in two phases:

(i) Phase-1: Specially designed questionnaire was administered to all the 25 universities / institutes to generate benchmark for broad characteristics and, obtained the required information like: type of Science faculties; their research activities support they received through NET / GATE or sponsorship for PhDs; year-wise enrollment of the students having completed the doctorate etc. Followed by Direct interactions with faculty members, experts to get their perceptions on the subject. These entry-level questionnaires acted as initial reference material in defining the population that formed the basis of further analysis, under the phase-2.

(ii) Phase-2: Another questionnaire was sent to PhD awardees, through post / e-mail and also placed on the NRIF-Website to get the responses from the respondents, who had responded to the entry-level questionnaire for the study period of three years during: 1999-2000 to 2001-2002.

Data Sources

1. **Background**: These **25** universities / institutes have approx. **231 Faculties of Sciences**. With a huge list of departments, the study for operational convenience, **classified all the science faculties into 5 broad categories,** viz. **a) Life / Biological Sciences; b) Physical Sciences; c) Chemical Sciences; d) Mathematics & Statistics**; and, e) **Inter-disciplinary sciences** (Including Environmental Sciences, S&T Policy etc.)

2. **Target Population and sample size covered**:

- During the reference period 1999-2000 to 2001-2002, the number of total PhD scholars who completed PhD from these **25 universities / institutes** were tentatively **3053** scholars.

- The Sample population covered was approx. **1,221**, i.e. 40 % of TP & 60 % of NS who responded to the questionnaire.

Year	Sample	%
'99-'00	1,099	36
'00-'01	1,039	34
'01-'02	0,915	30
T P	**3,053**	**100**
Returned	1,000	#
Net Sample	**2,043**	**60 of NS**
Response	**1,221**	**40 of TP**

TP : Total Population   NS : Net Sample
% Age response of Total Population;
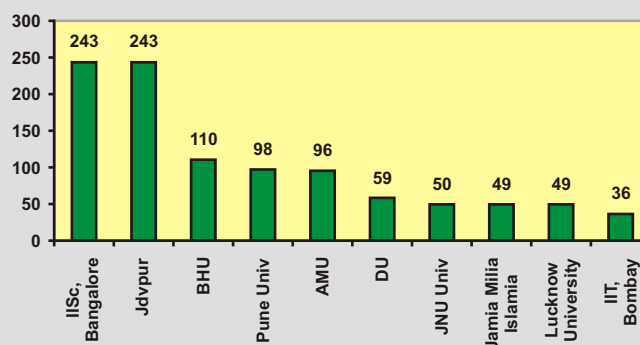% Age response of Net sample
: Due to changed addresses

Chart 1
Population of Respondents: Area / Social Category wise (Rural, Urban & Total Sample Population)

Legend: RURAL, URBAN, OVERALL

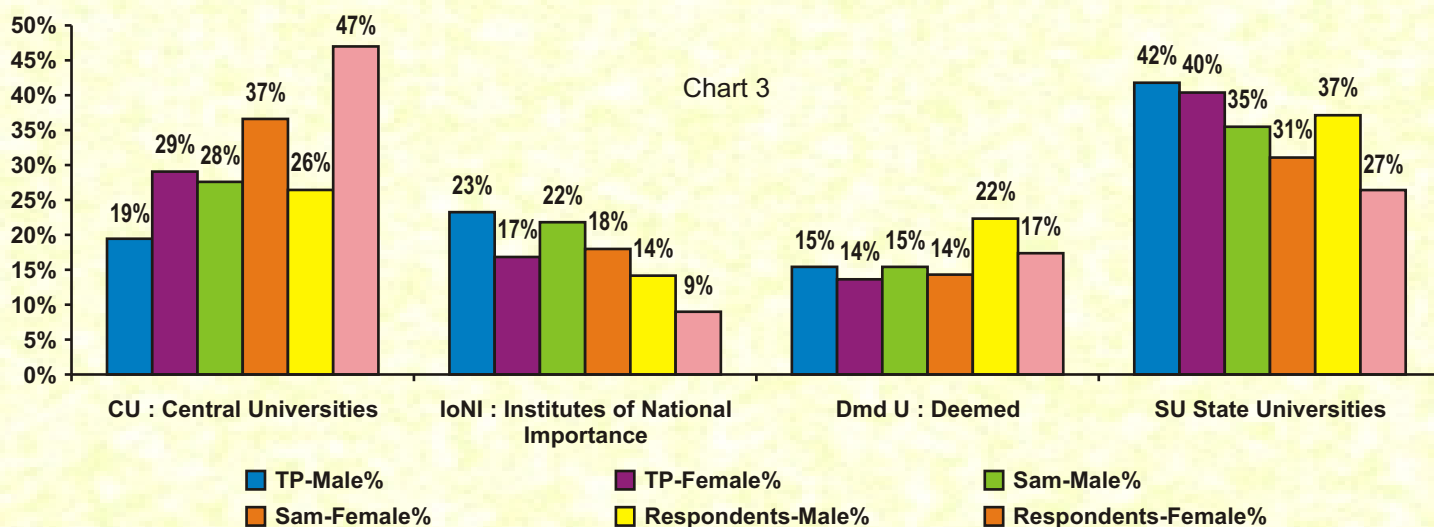Categories: GENERAL (881), SC (37), ST (45), OBC (258), overall (1221)
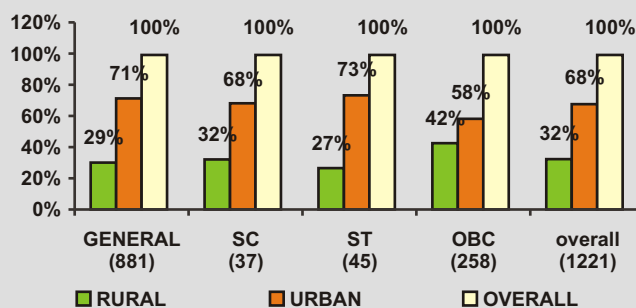
Chart 2
Top Ten Univ./Inst

The number of respondent's from top ten universities / institutes ranged between 243 from IISc, Bangalore & Jadhavpur Univ. (243), to 36 from IIT Mumbai followed by others.

IISc, Bangalore 243; Jdvpur 243; BHU 110; Pune Univ 98; AMU 96; DU 59; JNU Univ 50; Jamia Milia Islamia 49; Lucknow University 49; IIT, Bombay 36

Institutional Category Representation : Total Population of PhD Scholars vis-à-vis Sample and Respondents

Chart 3

CU : Central Universities — 19%, 29%, 28%, 37%, 26%, 47%
IoNI : Institutes of National Importance — 23%, 17%, 22%, 18%, 14%, 9%
Dmd U : Deemed — 15%, 14%, 15%, 14%, 22%, 17%
SU State Universities — 42%, 40%, 35%, 31%, 37%, 27%

Legend: TP-Male%, TP-Female%, Sam-Male%, Sam-Female%, Respondents-Male%, Respondents-Female%
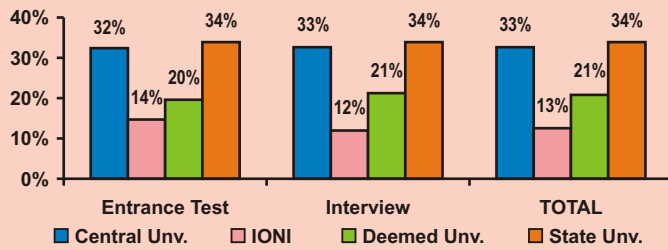
The Main Report has been organized into **seven chapters**, followed by Appendices. **Chapter-I:** Introduction: provides an overview of PhDs in Science faculty in India and a brief comparison at international scenario, besides listing the limitations of the Study, which may have bearing on the interpretations and conclusions; **Chapter-II:** Objectives and Methodology; **Chapter-III:** Characteristics of PhD Scholars; **Chapter-IV:** PhD Research Process, Facilities and Output; **Chapter-V:** Career Profile of PhDs in Science & Technology, besides giving an open-ended opinion by the scholars about the odyssey faced by them during and completion of their PhD; **Chapter-VI:** Summary of Findings and Conclusions; **Chapter-VII:** Suggestions and recommendations.
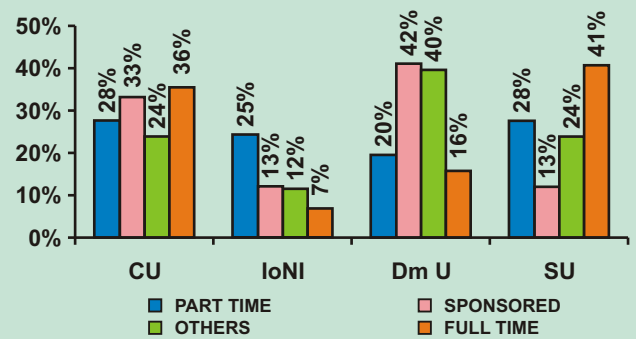
Sample Characteristics
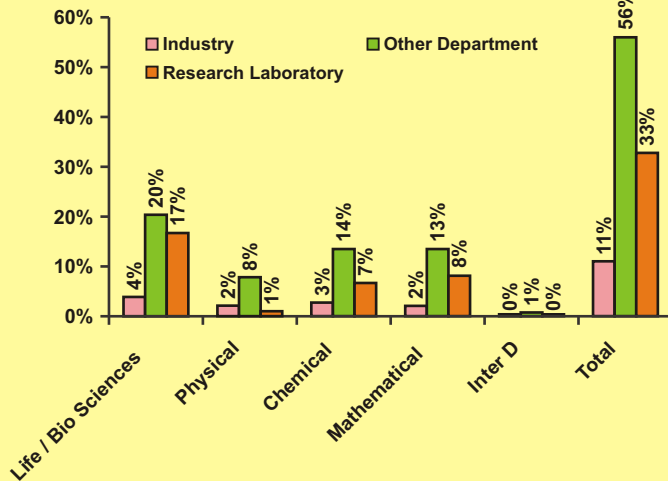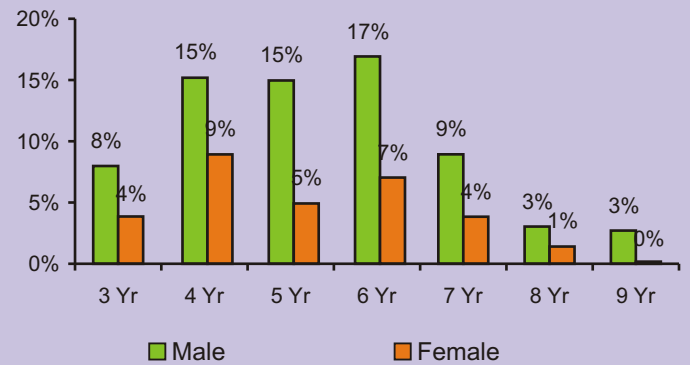
Enrolment & Selection Criteria — Chart 4

Central Unv. 32% (Entrance Test), 33% (Interview), 33% (TOTAL)
IONI 14%, 12%, 13%
Deemed Unv. 20%, 21%, 21%
State Unv. 34%, 34%, 34%

Legend: Central Unv. | IONI | Deemed Unv. | State Unv.

Completion of PhD Category-wise — Chart 5

	CU	IoNI	Dm U	SU
PART TIME	28%	25%	20%	28%
SPONSORED	33%	13%	42%	13%
OTHERS	24%	12%	40%	24%
FULL TIME	36%	7%	16%	41%

Legend: PART TIME | SPONSORED | OTHERS | FULL TIME

Choice of guide from various agencies under different Disciplines — Chart 6

Legend: Industry | Research Laboratory | Other Department

Discipline	Industry	Other Department	Research Laboratory
Life / Bio Sciences	4%	20%	17%
Physical	2%	8%	1%
Chemical	3%	14%	7%
Mathematical	2%	13%	8%
Inter D	0%	1%	0%
Total	11%	56%	33%

Gender-wise period of completion of PhD — Chart 7

	3 Yr	4 Yr	5 Yr	6 Yr	7 Yr	8 Yr	9 Yr
Male	8%	15%	15%	17%	9%	3%	3%
Female	4%	9%	5%	7%	4%	1%	0%

Legend: Male | Female

Motivating Factors ➤

Factors that Motivated (Multiple answers)	Respondents *
Purely academic interest	1062 (87%)
To obtain a particular kind of job	366 (30%)
No better option	85 (7%)
Others (Qualify)	61 (5%)
Family Pressure	49 (4%)
To meet minimum requirement	37 (3%)
Sponsored by the organizations	24 (2%)
Peer Pressure	12 (1%)
Overall (> sample 1221)	**1697**

* %Age to total under each category

Year-wise enrollment trend (left segment) vis-à-vis PhD out-turn (right segment of the graph)

Chart 8

Enrollment trend during years (which included respondents)

Respondents trend that completed PhD from 1999 onwards

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Enrolment Yr.	89	85	122	134	147	269	232	256	195	198			
Year of award										208	244	379	390
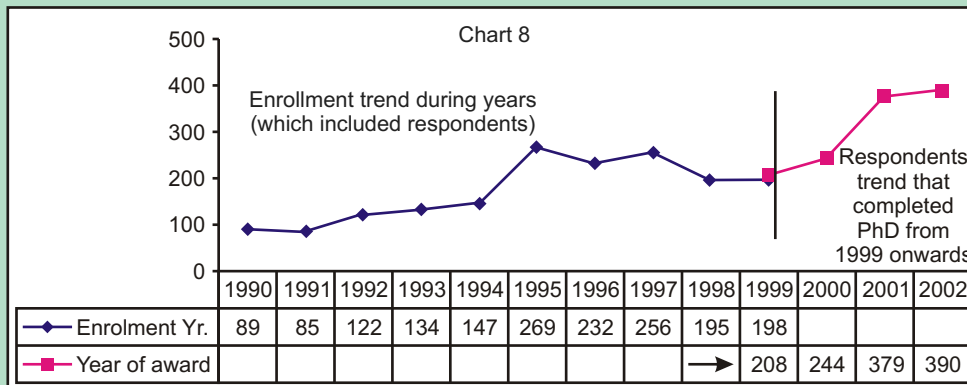
Read with Chart 7 giving period of completion of PhD

Aspects / constraints that affected research work during the programme

Approx. 30% of respondents faced constraints during completion of PhD programme.

Constraints	Response
Lack of proper infrastructure facilities	159
Non-cooperation from the guide	73
Financial Problem	49
Part-time job	37
Time constraint	24
Lack of funds in the university's department	12
Family problem	12
Total	**366**

Getting special incentives in present job after obtaining PhD

Special incentive	Respondents	%
Getting incentive	402	33%
Do not get incentive	819	67%
TOTAL	**1221**	**100%**

Benefits / outcome after obtaining the Doctoral Degree

Agreement statement on obtaining degree	Respondents
Invitation to different academic / professional courses	818 (67%)
Better prospects for moving abroad	818 (67%)
Prospects of getting more lucrative job	610 (50%)
The doctoral degree has enhanced prestige	537 (44%)
Others	61 (5%)
TOTAL	**2844** (100%)

Study handled by

Natural Resources India Foundation (NRIF)

The NRIF expresses its gratitude to NSTMIS, DST, MoS&T, GoI, for funding this study. Our thanks are due to Members of the LPAC and officials of the NSTMIS, DST, GoI, for their invaluable cooperation and necessary guidance & assistance while undertaking this study.

(NRIF is A not-for-profit NGO working on the issues related to research, consultancy & Turnkey jobs in the fields of : natural resources- agriculture, forestry, environment, water management, S&T, rural livelihood, development finance, economic security, and women empowerment…. programs in India & Abroad)
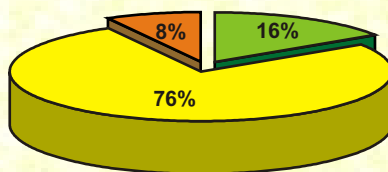
Placement Analysis
Chart 9

- FOREIGN
- GOVT.
- PRIVATE

Placements	Male	Female	Total Resp.
Foreign	136	59	195
Govt.	649	278	927
Private	70	29	99
Total	**855**	**366**	**1221**

Nature of Present Job
Chart 10
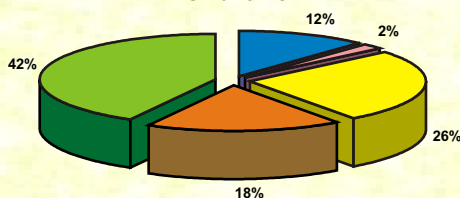
- ACADEMICS
- R & D
- TEACHING
- MANAGEMENT
- S & T RESEARCH

Odyssey faced by scholars during PhDs process & after completion of PhD

- Unavoidable delays have taken place due to sudden breakdown of the instruments, procurement delays, computer data thefts, group-ism, rivalry, etc.
- Economic Constraints, especially for Projects demanding, multi-step procedures or steps needed critical monitoring, eventually drained out the entire hard-work due to unavailability of professional expertise;
- Few of the Guides have acted as Demotivators, because of casual approach and turning deaf ear to problems faced by scholars, External reasons when PhD scholars get frustrated, include a boost / steep rise in the wages of IT sector, Corporate not looking beyond Bachelor's or MBAs for mid-run IT, sales or marketing divisions;
- Such a trend has lead that number of PhDs have started falling with alarming rate to a mere one-third of the capacity of the engineering colleges. Thus bright scholars being weaned away by the industry etc;
- Even with PhD qualification, one slogs in the non-standard self-finance colleges / institutes, because State Govts. have stopped recruitment of lecturers in Govt. Colleges and Govt. aided / UGC aided Colleges / Institutes;
- Even many Private Industries / Firms are not forth coming to provide recruitment to many PhD scholars, because of lack of collaborations;

Odyssey : *Long adventurous journey, series of wanderings*

PhD Respondents serving abroad

Country	No. of Students Abroad
1. Australia	1
2. Baghdad	1
3. Bangladesh	10
4. Canada	7
5. Egypt	1
6. France	13
7. Germany	9
8. Holland	1
9. Hong Kong	1
10. Iran	1
11. Japan	9
12. Jordan	1
13. Nepal	1
14. New Zealand	1
15. Palestine	2
16. South Korea	1
17. Sudan	1
18. Taiwan	1
19. UK	1
20. USA	131
21. Zurich	1
Total	**195**

Suggestions by the PhD Scholars for improving research quality & motivation

- Candidates with sound knowledge in the subject and commitment to teaching should only be appointed as teacher in college;
- Reduce teacher student ratio. Appointment of more faculty / Research scholars be made;
- Substandard Academic institutions must be wound up / closed;
- Ph.D. is not to be bound by any NET examination;
- Degree courses should be modified based on recent developments in the subject. It should be applied and, job oriented;
- There should be project-based evaluation in M Sc;
- Nature of examination system should be changed;
- Education system should be more research oriented;
- Application of Basic Research in Industries;
- Ph.D. students should be admitted through merit basis only;
- Develop more career guidance centers;
- Every scientific research must have some technological aspects;
- Introduce tough selection procedure to substantially improve the over all research quality in the country;