Job Uncertainty After Ph.D. : A Common Concern for Doctoral Students of Technical Institutes of North East India

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Abstract

A doctoral degree is the highest level of academic degree awarded by an academic institute. The doctoral program not only prepares the workforce to become faculties, administrators, and researchers in an academic institute, but also prepares the workforce for industry and business organizations. These workforces play a very important role in developing innovation that drives the economic growth of a nation. Attrition of doctoral students potentially wastes resources and time of both faculties and students which could otherwise be utilized elsewhere. High attrition reduces research output, which is an important factor while evaluating the status of an institution.

Limited numbers of studies have been done on doctoral students' satisfaction and attrition in India. The present study was an attempt to explore the experience of doctoral students and also to find the factors influencing satisfaction of doctoral students studying in technical institutes of North East India. An offline survey was conducted with 300 doctoral students studying Engineering, Science, Mathematics, and Humanities & Management. Data collected were analyzed using factor analysis and hierarchical multiple regression. Supervisor/Guide and Department Support, Reason for Doing Ph.D., Stress and Lack of Motivation, and Insecurity were found to contribute 41% to doctoral students' satisfaction with a *p* - value of 0.039. The doctoral students studying in different departments had a common fear of not getting a matching job after Ph.D.

Keywords : attrition, doctoral students, higher education, satisfaction, student - guide relation

JEL Classification : I20, I21, I23, I29

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Although there have been challenges in the Indian higher education system, attrition of students from master and doctoral programs, poor quality of research output, unavailability of qualified faculties during faculty recruitment in top Indian institutes are current issues in the Indian higher education system

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(Choudhury, 2016 ; Nema & Kasliwal, 2018; Ramanathan, 2018 ; Singh, Singh, & Singh, 2014). Every year, hundreds of students pursuing Ph.D. in IITs drop out of the course.

According to Bair and Haworth (2005), doctoral students drop out for different reasons such as the relationship between student and guide, lack of support from the department, financial issues, stress, demotivation, fear of failure, personal issues, and environmental issues. So, the institutes and the concerned authorities should take up necessary steps to monitor the doctoral programs.

However, according to Elgar (as cited in McAlpine & Norton, 2006), senior administrators of institutions such as the Dean blame students for dropping out of the doctoral program and do not keep statistics on doctoral attrition and nor do they ask departments heads to do so. They further estimated shorter time and higher level of doctoral completion than other universities.

Doctoral students' voice is least heard even though they are central to the doctoral undertaking. Their academic experience might include financial issues, overwhelming program requirements, isolation, familial issues, and fear of no or less career opportunities after Ph.D. Unsatisfied students are the ones who drop out of the doctorate programs. Many foreign universities such as Swedish University of Agricultural Science (SLU), Pompeu Fabra University (UPF), and UC Berkeley conduct Ph.D. students' satisfaction surveys at regular intervals. Correct information from doctoral students from such surveys is a strategic tool to improve the doctoral program and doctoral students' persistence. Student satisfaction surveys offer several implications for policy and practice. Students' satisfaction data can be collected through exit interviews, feedback from current students and alumni, ongoing programs, and classroom assessment. Limited studies have been conducted in this regard for Indian universities and no such study has been done on educational institutions in the North East region. Doctoral students' attrition is a waste of scarce resources and time of both faculties and students, which might have been used in other productive areas. A student's persistence in an institute is determined by the degree to which the student is integrated socially and academically with the institute. A serious study and possible changes in doctoral education can be achieved if we think and act based on the integrative factors influencing the experience of doctoral students. The study aims to explore the experience of doctoral students studying in technical institutes of North East India.

Literature Review

Around 40% - 60% of doctorate students studying in American colleges and universities did not persist upto graduation (Berelson, 1960 ; Bowen & Rudenstine, 1992). A significant problem in Australian, British, Canadian, and U.S. universities and one of academia's well-kept secrets is doctoral attrition. On an average, 30% - 50% of the students drop out depending upon the field of study (Berelson, 1960 ; Lovitts, 1996, 2001).

According to McAlpine and Norton (2006), attrition results in loss of highly educated individuals and is happening while nations attempt to compete globally in the knowledge economy. Both corporates and governments recognize doctoral education as a strategic tool for the enhancement of their respective nations' economic health, for example, the need for a more highly qualified individual in order to build and maintain invigorated national research and development agendas. Yet, the call for action to address the issue of doctoral attrition is always temporary and is handled in an isolated fashion. The factors influencing the problem of doctoral attrition are complex and there is a need to suggest an integrative framework that incorporates societal, institutional, and departmental contexts influencing the outcome of doctoral education.

According to Bair and Haworth (2005), doctoral students drop out for different reasons such as the relationship between student and guide, lack of support from the department, financial issues, stress, demotivation, fear of failure, personal issues, and environmental issues. Faculty and administrators should carefully monitor the doctoral admission process as well as students' orientation program. Both faculty and student expectations should be clear from the beginning of the program, and there should be clarity in the students' evaluation criteria.

Flores - Scott and Nerad (2012) explained that peers can play a key role in the development of doctoral students into independent researchers and members of academic communities. Peer interaction is quite different from the hierarchical interaction between advisors and students, where students learn how to do research from their advisors. In interactions among peers, they provide and receive constructive feedback ; learn how to accept criticism from others ; peer advisers can communicate their own experiences and share how they coped up with the hardships and recommend strategies for success.

Student satisfaction survey studies offer several implications for policy and practice. Exit interviews, feedback from current students and alumni, and ongoing program and classroom assessment can be used to collect student satisfaction data (Angelo & Cross, 1993).

During 2012 - 2014 in IIT Bombay, 9 out of 10 dropped out were Ph.D. or M. Tech. students. Similar trends were also found in other IITs. Among the 548 who dropped out of IIT Delhi during 2012 - 2015, only 11 were B.Tech students. The dropout rate was equally high at IIT Kharagpur and IIT Roorkee. While 228 students dropped out from IIT Roorkee in 2014 - 2015, 209 quit IIT Kharagpur the same year (Mohanty, 2015).

Rout and Ramdas (2015) suggested that familial, financial, academic-related, and personal issues were the reasons for dropping out of higher education in India. They further explained that even though financial, institutional/academic, and participation in economic activity related reasons influenced students not to complete higher education, the magnitude of the effect of the institute/academic related problems highly and significantly contributed to students' withdrawal from higher education.

Objectives of the Study

The purpose of this study is to explore the experience of doctoral students studying at technical institutes in North East India. An attempt has also been made to find the factors influencing doctoral students' satisfaction.

Methodology

A sample of four technical institutes - two old and two new - were selected out of eight such technical institutes located in the North East Region of India. An offline questionnaire survey was conducted with 300 full-time Ph.D. scholars studying in these four institutes in the field of Science, Engineering, Mathematics, and Humanities & Management departments.

Table 1. Gender - Wise Distribution of Doctoral Students Studying in Different Fields

Field of Study	Male	Female	Total
Engineering	120	85	205
	(70.18)	(65.89)	(68.33)
Science	34	27	61
	(19.88)	(20.93)	(20.33)
Mathematics	12	7	19
	(7.02)	(5.43)	(6.33)
Humanities & Management	5	10	15
	(2.92)	(7.75)	(5.01)
Total	171	129	300
	(100)	(100)	(100)

Note. Figures in the parenthesis represent a percentage.

A 5 - point Likert scale survey questionnaire consisting of 44 items was constructed. Data were collected in a span of 4 months between January to April 2018. The questionnaire included questions about department support, guide/supervisor relation with students, reason for pursuing Ph.D., stress, personal and financial issues, motivation, and course structure. A further breakdown of the study group is given in the Table 1.

The Table 1 shows the gender - wise distribution of the respondents. Out of the total 300 respondents, 171 were male and 129 were female ; 205 were from the Engineering department, 61 were from the Science department , 19 were from the Mathematics department, and 15 were from the Humanities & Management department. The data so collected were analyzed using factor analysis and hierarchical multiple regression in SPSS version 20.

Statistical Analysis and Results

The collected data were tested for factorability using Kaiser - Meyer - Olkin (KMO) and Bartlett's test for sphericity which measures for sample adequacy. The KMO value was higher than 0.6 and Bartlett's test of sphericity was found to be significant at the 99% level of significance ($p < .001$). The test results suggest that the data collected were appropriate to conduct a factor analysis. Maximum likelihood with direct oblique rotation was applied as a factor analysis method. Four factors with Eigen value greater than 1 and percentage of variance of at least 5 % were extracted.

As depicted in Table 2, the first factor is named as Guide & Department Support. The first factor consists of 8 items with factor loading range from 0.914 to 0.377 and explains 15.44% of the total variance. The second factor is named as Reason for Doing Ph.D. The second factor consists of 4 items with factor loading range from 0.844 to 0.380 and explains 8.57% of the total variance. The third factor is named as Stress & Lack of Motivation. The third factor consists of 7 items with factor loading range from 0.703 to 0.401 and explains 7.78% of the total variance. The fourth factor is named as Insecurity; the fourth factor consists of 3 items with factor loading range from 0.706

Table 2. Factor Analysis

Factor Title	Questions	Statements	Factor Loading	Explain variance(%)	Cronbach's Alpha
Guide &	Q.1	Overall, I am satisfied with the supervision	0.914	15.44	0.804
Department Support	Q.2	My guide provides me with adequate feedback	0.828		
	Q.3	Whenever I face a problem, my guide is easily approachable	0.801		
	Q.4	I have a very good relationship with my guide	0.547		
	Q.5	My department allows me to choose my guide/ advisor according to my preference	0.409		
	Q.6	My department provides a stimulating environment which fosters interaction and efficiency	0.388		
	Q.7	I feel that more job opportunities related to my department are available	0.385		
	Q.8	I am receiving proper support from my department (availability of instruments in the lab related to my topic / financial support to build a prototype, if required etc.).	0.377		
Reason for	Q.1	Contribute to science, global development	0.844	8.57	0.719
Doing Ph.D.	Q.2	New achievement	0.813		
	Q.3	My interest in learning/research experience	0.703		

	Q.4	Demanded by employers	0.380		
Stress & Lack	Q.1	I usually skip my lunch & breakfast	0.703	7.78	0.740
of Motivation	Q.2	I am not getting enough sleep	0.676		
	Q.3	The course curriculum is so rigid that a scholar gets very less opportunity to choose his/her topic/subject of interest	0.541		
	Q.4	After enrolling into Ph.D., I am getting less socially active	0.528		
	Q.5	I am not excited or learning anything	0.500		
	Q.6	I regularly do exercise/play outdoor games	-0.417		
	Q.7	I am overburdened with my Teaching Assistant assignments / related tasks	0.401		
Insecurity	Q.1	Even after completing Ph.D., I may not get a good salaried job	0.706	6.22	0.625
	Q.2	I will quit Ph.D. if I get a high salaried job	0.606		
	Q.3	I often feel the fear of failure	0.474		

Table 3. Correlation & Descriptive Statistics

	Ph.D. Student Satisfaction	Reason for Doing Ph.D.	Guide & Department Support	Stress & Lack of Motivation	Insecurity	Mean	Standard Deviation
Ph.D. Student Satisfaction		-0.088	0.568**	-0.369**	-0.166**	2.550	1.011
Reason for Doing Ph.D.			0.111	0.043	-0.099	2.720	0.620
Guide & Department Support				-0.353**	-0.085	2.200	0.870
Stress & Lack of Motivation					0.164**	3.150	0.634
Insecurity						2.720	0.974

Note. ** significant at 0.01 level of significance.

Table 4. Hierarchical Multiple Regression

	Model 1			Model 2			Model 3		
Variable	***B***	***SE B***	β	***B***	***SE B***	β	***B***	***SE B***	β
Insecurity	-0.11	0.05	-0.10	-0.12	0.05	-0.11	-0.11	0.05	-0.11
Stress & Lack of Motivation	-0.56	0.09	-0.35	-0.55	0.09	-0.34	-0.25	0.08	-0.16
Reason for Doing Ph.D.				-0.13	0.09	-0.08	-0.24	0.07	-0.14
Relation with Guide & Department Support							0.60	0.05	0.51
Adjusted R^2		**0.11**			**0.12**			**0.41**	

Note. Unstandardized regression coefficient (*B*), the unstandardized standard error of regression coefficients (*SE B*), the standardized regression coefficient (β).

to 0.474 and explains 6.22% of the total variance. The four factors : Guide & Department Support, Reason for Doing Ph.D., Stress & Lack of Motivation, and Insecurity explain 38.1% of the total variance.

Reliability test is run for all the factors - Guide & Department Support is assessed with 8 items (Cronbach's $\alpha = 0.80$) ; Reason for Doing Ph.D. is assessed with 4 items (Cronbach's $\alpha = 0.71$) ; Stress & Lack of Motivation is assessed with 7 items (Cronbach's $\alpha = 0.74$) ; Insecurity is assessed with 3 items (Cronbach's $\alpha = 0.62$). A reliable scale was developed to measure the satisfaction of the Ph.D. scholars.

To examine the influence of the factors - Insecurity, Stress & Lack of Motivation, Reason for Doing Ph.D., and Guide & Department Support on doctoral students' satisfaction, we conduct hierarchical multiple regression analysis using SPSS Version 20. Variables were entered into the model beginning with (1) Insecurity, Stress & Lack of Motivation ; (2) Reason for Doing Ph.D.; (3) Guide & Department Support. The Table 4 displays the unstandardized regression coefficient *(B)*, the unstandardized standard error of regression coefficients (*SE B*), the standardized regression coefficient (β), R^2, and *F* for changes in R^2.

The present study results in some important findings. The Engineering students mentioned if they quit, the following might be the reasons for dropping out of the doctoral program: "Not sure to get a good salaried job after Ph.D." was mentioned by 12% of the respondents ; "lack of support from the department (lab infrastructure & instruments)" was mentioned by 10% of the respondents ; "because of my guide" was mentioned by 6% of the respondents ; and topic related issue was mentioned by 5% of the respondents.

For Basic Science students, if they quit, the following might be the reasons for dropping out of the doctoral program: "Not getting enough support from the department (lab infrastructure & equipment)" was mentioned by 17% of the respondents ; "Not sure to get a good salaried job after Ph.D." was mentioned by 11% of the respondents ; and topic related issue was mentioned by 5 % of the respondents.

For Mathematics students, if they quit, the following might be the reasons for dropping out of the doctoral program: "Not sure to get a good salaried job after Ph.D." was mentioned by 30% of the respondents ; topic related issue was mentioned by 23% of the respondents ; and "because of my guide" was mentioned by 7% of the respondents.

Similarly, for Humanities & Management students, if they quit, the following might be the reasons for dropping out of the doctoral program : "Not sure I will get a good salaried job after Ph.D." was mentioned by 33% of the respondents and "lack of department support" was mentioned by 22% of the respondents.

Correlation and Descriptive Statistics

Pearson product-movement correlation coefficient was run in SPSS version 20 to compute the correlation between the dependent variable (Ph.D. Student Satisfaction) and independent variables (Guide & Department Support, Stress & Lack of Motivation, Reason for Doing Ph.D., Insecurity).

The results from the Table 3 suggest significant ($p < 0.01$) positive correlation between Ph.D. Student Satisfaction and Guide & Department Support. With an increase in student - guide relation and department support, there is an increase in satisfaction of doctoral students.

There is a significant ($p < 0.01$) negative correlation between Ph.D. Student Satisfaction and Stress & Lack of Motivation. With an increase in Stress and Lack of Motivation, the satisfaction of doctoral students decreases.

Similarly, there is a significant ($p < 0.01$) negative correlation between Ph.D. Student Satisfaction and Insecurity. More the students become insecure about their future and career path, the less satisfied they are with their doctoral studies.

Interestingly, we find that there is no significant correlation between Ph.D. Student Satisfaction and Reason for Doing Ph.D. So, we might interpret that students enrolled in the doctoral program as a last career option.

The Table 4 reveals that Insecurity, Stress & Lack of Motivation was entered at Step 1 and predicts only 11% of doctoral students' satisfaction [$R^2 = 0.123, F(2,275) = 19.36, p = 0.00$]. When Reason for Doing Ph.D. is entered at Step 2, there is a 0.6% increase in predictive capacity [$R^2 = 0.129, F(3, 274) = 13.58, p = 0.00$]. Finally, Guide & Department Support was entered at Step 3, and there is a significant improvement in the model with 29.7% increase in predictability, [$R^2 = 0.427, F(4,273) = 50.88, p = 0.00$].

Model equation :

$$Y = 3.005 - 0.114X_1 - 0.258X_2 - 0.243X_3 + 0.601X_4 \quad ....(1)$$

where,

Y= Ph.D. Student Satisfaction

X_1 = Insecurity

X_2 = Stress & Lack of Motivation

X_3 = Reason for Doing Ph.D.

X_4 = Guide & Department Support

Ph.D. Student satisfaction increases 0.601 times for each increase in Guide & Department Support. All the independent variables are significant predictors.

Implications and Suggestions

The present study can be highly pertinent for institutions for proper monitoring of the doctoral student's persistence at the program. The findings of the present study have some important implications for students, faculty, policymakers, and administrators.

Faculties play an important role, and they can make a lot of difference on students' outcome. Frequent faculty - student interactions have an impact on students' ways of thinking, problem-solving techniques, and career choices. Students should seek opportunities to interact with their faculty outside of class, use faculty office hours to interact with faculty, as well as participate in the events organized by their department. Students should not limit their interaction with their department faculty as knowing faculties from other departments would be helpful (Endo & Harpel, 1982). An academic environment is full of knowledgeable people ; students might find good research topics after interacting with faculties from other allied departments. Mutual interaction between peers increases socialization among doctoral students formally or informally, which helps doctoral students learn the value, skill, and norms of other interdisciplinary fields, provide peer mentoring and emotional support to one another.

Doğan and Bıkmaz (2015) explained that while choosing the thesis advisor, doctoral students preferred a supervisor having extensive knowledge in their field with sound knowledge of research methods and techniques. Mainhard, Rijst, Tartwijk, and Wubbels (2009) suggested that doctoral students expect supervisors to have qualities such as good listener, understandable, friendly, and provide feedback and support on research issues.

Higher education in India neglects its research programs. India invests only 0.85% of its GDP on research as compared to 2.74% for the U.S., 2.10% for China, 3.58% for Japan, 2.84% for Germany, and 4.29% for South Korea (Sharma, 2017).

Such compromises have an impact on the entire education system resulting in poor quality of research output resulting into lack of qualified candidates at the time of faculty recruitment at top Indian institutes. IIT Delhi and IIT Bombay hired over 75% of their new faculties across three departments with foreign Ph.D.s (Pushkar, 2015). Preference of faculties having Ph.D. from foreign universities implies that Indian higher educational institutes do not believe or have less confidence in their own Ph.D. programs.

Most postgraduate students conduct research with no industry or business application in their mind (Cabral - Cardoso, 2001). It would be a good initiative to provide a platform for doctoral students to interact with the industry so that they can get an idea of how well they can integrate their research with the corporate environment. Such activity can pull funding for academic institutions to work on R&D projects for the industry, thereby giving doctoral students an exposure to integrate their learning to business organizations. Vocational training related to industry might also improve the skill set and confidence of doctoral students while looking for jobs outside academics. Recently, IIT Delhi has taken a new initiative to help their Ph.D. students convert their theses into

startups. IIT Delhi will provide seed funding, free mentoring, accommodation, and access to IIT Delhi Labs to the short listed doctoral candidates. Even though there are challenges, there are also opportunities to make the Indian higher education system much better. It is high time for Indian educational institutes, the government, and policymakers to focus on research programs.

Conclusion

Since the study focuses only on technical institutes, the generalizability of the findings of this study are limited. However, the findings of this study provide a baseline for further study on doctoral education at technical institutes and universities in India.

In the present study, 13% of the respondents mentioned uncertainty to get a good salaried job after Ph.D. to be a reason to quit their doctoral studies ; 12% of the respondents mentioned lack of support from the department to be a reason to quit their doctoral studies ; 5% of the respondents mentioned issues related to the research topic to be a reason to quit their doctoral studies ; 4% of the respondents mentioned their guide might be a reason to quit their doctoral studies. A common fear among doctoral students studying in different departments was not getting a job after Ph.D.

The study also finds four main factors affecting doctoral students' satisfaction. They are : Guide & Department Support, Reason for Doing Ph.D., Stress & Lack of Motivation, and Insecurity. All these four factors are found to contribute 41% to doctoral students' satisfaction with a p -value of 0.039.

An analysis of the perceptions and experiences of faculties while interacting with their students along with the feedback from dropout students could help give a more complete description of doctoral students' satisfaction. Frequent faculty - student interaction might reduce the gap between students and guides. A greater involvement between the guides and students while selecting the research topic might reduce topic related issues. If academic institutions are sincere in their desire to reduce attrition, increase research output, and improve their institute's global ranking, then academic administrators and policymakers along with the respective departments should closely monitor the doctoral programs. Graduate schools must build an environment that allows students to air their concerns about their programs and their conduct without fear that students will be diminished in the eyes of their peers and the faculty who train them and without fear that they will be risking their scholarship(s), assistantship(s), and job placements. Giving emphasis to peer learning might help doctoral students to be better prepared as independent and interdisciplinary researchers. Solving the problems faced by doctoral students at the right time might reduce attrition rate and shorten time to achieve their endeavoured degrees.

Limitations of the Study and Scope for Future Research

In the present study, experience and viewpoint of current doctoral students studying in technical institutes were considered. Therefore, the findings of the study may not be generalizable for all the institutions and universities.

Some experts have pointed out that Indian students studying in higher education institutes are more job oriented rather than research oriented (Mohanty, 2015). Students consider joining top institutes like IITs, NITs only to get a better job or while searching a job get enrolled in Ph.D. to get a monthly stipend; once they get a high paying job, they leave their studies. Considering the viewpoint of all the stakeholders of an academic institute such as faculties, recent Ph.D. recipients, and dropout students (even though it is difficult to track dropout students and contact them) will give a better result of doctoral students' satisfaction and attrition. A similar study can be done on part-time doctoral students' satisfaction as it might give new and unique results.

A study can be done comparing doctoral students' experience at technical institutes like IITs and NITs with that of Central Universities. Doctoral students' persistence and attrition also depends on the field of studies ; in the

present study, limited number of science and social science departments were considered. A similar study at the university level might cover more departments which may give different factors influencing doctoral students' satisfaction. A study can also be done on the readiness of Indian doctoral students to join corporate or business organizations after Ph.D. and what are the barriers which prevent them to integrate to the corporate environment.

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