



Ph.D. PROGRAM QUALITY ASSURANCE – A COMPARATIVE STUDY

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ABSTRACT

The Higher Education Commission (HEC) of Pakistan has introduced "Ph.D. Indigenous – 5000 Fellowships" Program since 2004. Many queries have been raised on the quality of program from different forums. The print and electronic media have also played their pivotal role to thrash out the situation. But still much confusion is around. Therefore, it becomes very essential to look at various aspects of the program critically with reference to the competitive world. In this study:

- 1) Historical background, creativity techniques, research ethics and processes, course and residency requirements, research opportunities, exams and Quality Assurance (QA) of PhD program of world class universities are discussed.
- 2) The HEC Indigenous Ph.D. program is described with reference to objectives, eligibility criteria and program requirements. The QA measures taken by HEC are discussed.
- 3) A survey is conducted to investigate the perception of scholars about various aspects of PhD program. Issues and problems being faced by the scholars regarding GRE subject international, admission procedures, course work, residency requirements, research supervisors, research material, synopsis, research activities, digital library, and evaluation of thesis are described.
- 4) Quality Assurance (QA) is to be seriously taken. For the survival in global village it becomes essential to achieve universal standards in academics. Which is not possible at all without taking care of QA measures? The quality measures taken by HEC are compared with those of global universities.
- 5) The areas require improvement are suggested in the perspective of scientific study and working of world class universities. These include curriculum and comprehensive exam of 18 credit hours course work, approved journals, research activities and industrial & community links.

Key words: Target population, sampled population, simple random sample, standard deviation, coefficient of variation and interval estimator

1. INTRODUCTION

1.1 *Historical Background*

The word *doctorate* originated from Madrasahs of Islamic Law. It was considered a License to Teach and issue Legal Opinions. The degree requirements were four years undergraduate and at least 10 years post graduate course. The successful

scholars were given the status of *faqih*, *mufti* and *mudarris*. In modern terminology these became *magister*, *professor* and *doctor*, respectively. In Europe *doctorate* was introduced as a license to teach at a university. In modern ages universities shifted to *research oriented* education and thus *doctorate* became prerequisite for university teaching career. ^[1]

The best known degrees of *research doctorates* are PhD, DEng, DSc, DLitt, EdD, DSocSci, DClinPsych etc. But the most common research degree is the Doctor of Philosophy (PhD). ^[1] This degree was first awarded in 1861 by the Yale University, followed shortly thereafter by the University of Pennsylvania in 1870. Harvard (1872) and Princeton (1879) awarded the degree of PhD. ^[1&2]

Three of the most well known creativity techniques are: Brainstorming, Inventive Problem Solving and Lateral Thinking. ^[3]

In the beginning research ethics were developed for medical research. The Declaration of Helsinki (1964) ^[4] is the basis for Good Clinical Practices which are being used till today. The issues of research in social and natural sciences are fraud, fabrication of information and plagiarism. In counter some ethical principals have been developed. These are: honesty, objectivity, integrity, carefulness, openness, confidentiality, social responsibility, non discrimination, competence, responsibility and legality^[5]. Moreover, respect for intellectual property and colleagues is essential. ^[5]

The research methods generally adopted by scholars include: Action Research, Case Study, Citation Analysis, Experience and Perception, Experiments, Mathematical Modeling, Participant Observation, Simulation, Statistical Analysis and Statistical Surveys. ^[6]

The standard scientific research process is acknowledged as: ^[6]

- 1) Introduction of the problem
- 2) Formation of hypotheses
- 3) Conceptual and operational definitions
- 4) Information collection and methodology
- 5) Statistical computations
- 6) Hypotheses Testing
- 7) Scientific conclusions

1.2 Course Requirements

In USA and Canada most of the universities require course work for PhD degree. In The UK universities in general don't have such condition. The course requirement varies with discipline. ^[7] Indiana University requires a total of 90 credit hours of graduate level course work for Computer Science degree. ^[8] The Aerospace Engineering, Wichita State University normally requires about 60 credit hours which include 24 dissertation hours. ^[9]

1.3 Residency Requirements:

In most of the Canadian universities, the completion time of PhD ranges from four to six years. German universities in general take three to five years to complete, strongly depending on the discipline. UK universities usually don't have formal classes. The research is conducted under the supervision of a professor independently. Thus, it is very rare for student to spend more than four years for PhD. USA universities generally take four to eight years to complete PhD after the Bachelor's degree and year or two less after Master's degree. ^[7]

1.4 Exams:

In Canadian universities after successful completion of the comprehensive examinations, the student becomes a PhD candidate. The maximum time is devoted to research. After the completion of a PhD thesis or dissertation, final requirement is an oral defense which may be open to the public. ^[7] In the universities of USA after comprehensive examination another two to four years are usually required for the composition of dissertation. Upon completion an oral examination by supervisory committee with expertise is required. ^[7]

1.5 Quality Assurance

The quality of research is assured by taking care of the following procedural requirements: ^[7]

- 1) PhD plan of study has to be approved.
- 2) Comprehensive examination given by the advisory committee is mandatory. It covers the major field.
- 3) Members of the advisory committee hold PhD degree.
- 4) No part of the comprehensive exam can be attempted more than twice.
- 5) Thesis proposal or synopsis is examined by the advisory committee.
- 6) PhD students defend their dissertation prospectus orally.

1.6 Funding

The funding facility for PhD program is available in the universities of Canada, France, UK and USA ^[7] In some universities of Canada most PhD students receive tuition amount for the first four years. Other source is assistantship in teaching or research. French Ministry provides funds for PhD research. Funding for PhD students in UK is provided by Research Councils, which consists of tuition fees together with a stipend for three years. In USA PhD students receive a tuition waiver and some from of annual stipend. The source varies with discipline and university. Assistantship in teaching and research is also available. Many are supported by fellowship or by their advisors' research grant.

2. INDIGENOUS PhD PROGRAM

Higher Education Commission (HEC) of Pakistan has introduced Indigenous PhD program. The 5000 PhD scholarships are planned to be allocated in five batches, preferably in the fields of Engineering Sciences, Pharmaceuticals, Biotechnology, Information Technology, Basic Sciences, Agricultural Sciences, Humanities, Social Sciences and Health Sciences. The scholars are expected to address social, economic and industrial problems decisive to the development of Pakistan. ^[10]

2.1 Objectives

The primary objectives are: ^[10]

- 1) Stimulate research and development activities in universities
- 2) Achieve social, economic and industrial sustainable development of Pakistan
- 3) Improve teaching and research potential of universities
- 4) Feed the industrial and corporate sector

2.2 Eligibility Criteria

The basic eligibility criteria to be a HEC PhD scholar are: ^[10]

- 1) Degree with minimum 18 years of education with CGPA 3:00 or more
- 2) Maximum age 35 years but for working it is 40 years
- 3) Full-time student
- 4) Qualify International GRE Subject Test
- 5) Supervision by HEC approved supervisor

2.3 Program Requirements

The PhD scholars are supposed to fulfill the following program requirements as recommended by HEC: ^[10]

- 1) Eighteen credit hours course work of specific discipline
- 2) Qualify comprehensive exam of 18 credit hours
- 3) Preparation and defense of synopsis
- 4) Approval of synopsis by Board of Studied and Advanced Research Board
- 5) Publish research paper in HEC approved journal
- 6) Completion of research work for PhD thesis or dissertation
- 7) Evaluation of Thesis by two experts from academically/ technologically advanced countries
- 8) Open defense of PhD thesis

2.4 Quality Assurance Measures

The quality assurance procedures adopted by HEC for the fully funded PhD Indigenous Program are: ^[10]

- 1) Well defined admission criteria
- 2) Internationally adopted rigorous research based course work
- 3) Impact Factor requirements for research supervisors
- 4) Access of scholars and supervisors to Digital Library
- 5) By Annual performance reports of scholars
- 6) Supply of Plagiarism Software (ithenticate) to detect plagiarism in PhD Thesis
- 7) Funds for seminars, workshops and conferences
- 8) HEC approved journals
- 9) External evaluation of PhD Thesis
- 10) Public oral defense of research

3. RESEARCH METHODOLOGY

The e-mail facility has made it possible to consider all 1,448 Indigenous PhD scholars scattered all over Pakistan as a Target Population. The 700 e-mail addresses are not working. Therefore, the Sampled Population remained as 748. A simple random sample of size 200 has been selected. This comprised as 26.7% of the Sampled Population and 13.8% of the Target Population. The questionnaire has been developed and e-mailed to 200 scholars selected as a sample. The 11 questions corresponds 37 indicators of quality of PhD program. These are:

- 1) Importance, standard and time justification of GRE subject international
- 2) Admission criteria and availability of research supervisor in the field of interest
- 3) Importance, contents, presentation and evaluation of 18 credit hours course work
- 4) Availability, involvement, commitment and competency of research supervisor
- 5) Availability of laboratory material, computer, software, journals and books
- 6) Approval procedures of synopsis
- 7) Guidance and financial facility for research publication
- 8) Opportunities to participate in seminars, workshops and conferences
- 9) Quality and quantity of research material provided by Digital Library
- 10) Evaluation Procedures of PhD thesis
- 11) Quality and Financial Management of PhD Program

Furthermore general comments are also invited. The questions are designed in such a way that enables the comparison of Indigenous and global PhD programs. The SPSS Version 13 is used for statistical findings. The response rate is 64%, which can be considered very high in case of e-mail questionnaire method of collection the information. The questionnaire with survey results are given in Appendix as Table I. For further elaboration and clarification Figure I is designed as given in Appendix. The statistical results described and analyzed in section 4 are based on Table and Figure I.

4. SURVEY RESULTS

The questionnaires are filled by the PhD scholars of HEC pursuing research in the universities of Pakistan. There are 37 indicators of quality of PhD program. For each indicator average, Standard Deviation (SD), Coefficient of Variation (CV), Interval Estimator (IE), and Percentages of Evaluation Scores (ESPs) are obtained. These are computed on the basis of Evaluation Scores (ESs), awarded by the 128 scholars. For inference Upper Interval Estimate (UIE) > 3 is desirable. The ESPs-(4 & 5) are combined and labeled as Remarkable Percentages

(RPs). The ESPs-(1 & 2) are combined and labeled as Alarming Percentages (APs). The RPs and APs are considered significant if $> 40\%$ of uniform spread and statistical significant if $> 48.5\%$ of UIE. The ESPs are considered significant if greater than 20% of uniform spread and statistical significant if $> 26.5\%$ of UIE. The $CV < 26\%$ shows consistent behavior. In this case minimum CV is 32.72% , i.e. for Open Oral Defense. In all other indicators CVs are higher and show high variability in the responses. It may be due to the diversity among educational institutions.

It is always difficult to analyze the general comments. However, some points have been picked and described as suggestions from scholars in sub-section 4.3. These may be from only a few individuals so do not carry any statistical significance.

4.1 Statistical Analysis

GRE Subject International: The GRE subject international should remain compulsory: average is 2.93, UIE = 3.23 and RP = 46 against AP = 47. The ESP-5 = 34 against ESP-1 = 32. This shows that scholars are very much decisive about the importance of GRE. It is also confirmed by ESP-3 = 07, i.e. only 7% are neutral.

There are reservations on the standard, relevance of contents and time duration. The averages are 2.57, 2.26 & 2.59 with UIEs < 3 and APs 34, 46 & 32, respectively. The most objectionable is the relevance of contents for which ESP-2 = 29 and is > 26 .

Admission Procedures: The criteria of admission and availability of supervisor are declared statistically fair by the scholars. The averages are 3.13 & 2.92 with UIEs 3.25 & 3.16; RPs 46 & 41 and EPSs-4 34 and 26, respectively.

For guidance average is 2.72 with UIE < 3 and AP = 46 against RP = 43. The ESP-2 = 29 against ESP-4 = 33. It shows scholar's desire to be properly guided by HEC about admission procedures.

Course Work of 18 Credit Hours: The averages of necessary and sufficient are high as 3.25 & 3.15 with UIEs 3.52 & 3.42 and RPs 56 & 53, respectively. Both of the indicators are statistical significant. Therefore, scholar's verdict is categorically in favor of course work.

There are reservations on curriculum, presentation, evaluation and research nature of the courses. The averages are 2.41, 2.49, 2.66 & 2.25 with UIEs < 3 and APs 52, 39, 34 & 55, respectively. For ESPs-2 for presentation and evaluation are 22 & 23, respectively. The most disturbing are curriculum and nature of the courses for which APs > 48.5 . Both of these indicators are statistically significant. The ESP-2 = 31 for curriculum shows dissatisfaction of 31% of scholars. This should be taken seriously. The presentation and evaluation are also need serious consideration but severity is lesser comparatively.

Research Supervisors Characteristics: The averages for availability, involvement, commitment and competency of the supervisor are 3.78, 3.48, 3.66 & 3.70 with UIEs 4.00, 3.70, 3.89 & 3.93 and RPs 70, 61, 66 & 65, respectively.

The percentages of ESP-5 are also amazing. All indicators are statistically significant and achieved very positive remarks by the scholars. For availability UIE rose up to 4.00. The research supervisors deserve congratulation for this achievement. In air many reservations have been floated about supervisors but the scholars have categorically rejected these doubts. The credit for care full selection of supervisors goes to HEC authorities.

Research Material: The averages of accessibility to computers, journals and books are 3.20, 2.94 & 2.80 with UIEs 3.44, 3.15 & 3.01; RPs 57, 45 & 38 and ESPs-4 42, 39 & 33, respectively. It is due to the good policies of HEC; Laptop for every scholar and access to digital library. Although for availability of books ESP-4 > 26.5 and is statistically significant but AP = 45 against RP = 38, should not be ignored. The scholars have shown satisfaction about the availability of relevant books but to the lesser extent than that of journals.

The average of equipped lab is 2.44 with UIE < 3 and AP = 45. The availability of lab equipment needs special attention.

Synopsis: The averages of referee's report and approval procedures are high as 3.10 & 2.88 with UIEs 3.35 & 3.12; RPs 54 and 43 and ESPs-4 41 & 34, respectively. The scholars have shown their satisfaction about both of the indicators but referees report achieved higher appreciation as compared to the approval procedures.

Research Publication: The averages of guidance, financial facility and approved journals are 3.63, 3.42 & 2.84 with UIEs 3.85, 3.68 & 3.07 and RPs 64, 64 & 38 respectively. The number of HEC approved journals is criticized with RP < 40 and AP > 40. Thus, more number of journals should be approved to facilitate research scholars.

Research Activities: The seminars are being organized and opportunities are available to attend the conferences. The averages are 2.84 & 3.28 with UIEs 3.06 & 3.51; RPs 39 & 55 and ESPs-4 31 & 37, respectively. Although for seminars RP = 39 which is less than 40% against AP = 41, but the difference is negligible. It can be concluded that scholars have shown their satisfaction on both of the indicators. This is the result of HEC's liberal policy for scholars to participate in seminars and conferences.

The averages of industrial/community and intervarsity links are 1.88 & 2.02 with UIEs <3 and APs 62 & 62. The ESP-1 is 37 & 33 for industrial / community and intervarsity links. Keeping in view the numbers this is an extremely disturbing situation. The scholars have shown their clear cut dissatisfaction in this regard. The research without strong industry, community and intervarsity links may not fulfill the objective of HEC, i.e. "Achieve social, economic and industrial sustainable development of Pakistan".

Digital Library of HEC: The sufficient numbers of journals are available in HEC digital library. The average is 2.95 with UIE=3.18, RP=46 and ESP-4=38.

There is a clear dissatisfaction about the availability of books. The average is 2.48 with UIE < 3, AP=50 and ESP-2=31. The availability of books needs special attention.

Evaluation Procedure of Thesis: The average of international referring and open oral defense are 3.57 & 3.84 with UIEs 3.81 & 4.06 and RPs 65 & 77, respectively. Both of the indicators are statistically significant. The research scholars have shown complete confidence on the policies of HEC. The idea of open oral defense of PhD thesis is highly appreciated. The UIE rose up to 4.06, the highest among all 37 indicators.

PhD Program: The averages of time allocation, quality and financial management are 3.40, 3.10 & 3.18 with UIEs 3.63, 3.31 & 3.42 and RPs 64, 48 & 49, respectively. All indicators are statistically significant. The ESP-4 of time allocation and quality are 44 & 41, respectively. This shows tremendous confidence of scholars, on both of these indicators. As a whole PhD program is appreciated by the scholars.

4.2 Concluding Remarks

- 1) The GRE Subject International may remain compulsory provided the relevance of contents is assured.
- 2) Guidance from HEC about admission is desired by the scholars.
- 3) The 18 credit hours course work is necessary and sufficient, as most of the Canadian and American universities do have (cf-sub section 1.2). But there are reservations on the curriculum, presentation, evaluation and nature of courses. The HEC should provide guide lines to universities for maintaining uniformity and standard in curricula and comprehensive exam. (cf- sub sections 1.4, 1.5 & 2.3).
- 4) The research supervisors are committed, competent; remain available and involved in research. It is basic requirement at global level for a member of advisory committee to hold PhD degree (cf-sub section 1.5). The HEC has developed very rigorous criteria for approved PhD supervisor. It is the reason behind this marvelous achievement of supervisors. The HEC is strictly following the supervisor selection criteria which are at par with the global standards.
- 5) The scholars are happy with the accessibility of computer, software and journals. But the special attention is required to improve the laboratory facilities and availability of relevant books.
- 6) The referrer's reports and approval procedures of synopsis are appreciated by the scholars. It is also the requirement of global quality assurance (cf-sub section 1.5).
- 7) The guidance and financial facility is available to publish research work. The HEC approved journals are less in number especially in arts and social sciences. This number should be increased.
- 8) The industrial, community and intervarsity links need to be enhanced.
- 9) Special attention is required to improve the availability of relevant books in the digital library.

- 10) The scholars have shown complete confidence on the policy of HEC in regard of evaluation of PhD Thesis by foreign referrers. The highly cherished idea is the open oral defense of submitted research.
- 11) The financial management of PhD program is appreciated by the scholars. In Canada, France, UK and USA the PhD scholars are also being funded by one way or the other. The scholars have shown their satisfaction about residency requirements, although it is less than Canada and USA. The scholars have also shown confidence upon the quality measures taken by the HEC. These are almost at par with the global quality assurance measures with the exception of comprehensive exam and residency requirements (cf-sub sections 1.6 & 2.4).

4.3 Suggestions from Scholars

The following worth mentioning suggestions are collected from the general comments given by the scholars at the end of the questionnaire:

- 1) Inclusion of Impact Factor and papers published in HEC approved journals, as part of admission criteria
- 2) The 18 credit hours course work should not be left as open ended
- 3) Increase in availability of supervisors, especially in the field of social sciences
- 4) Increase in lab funds
- 5) Number of scholars with one supervisor should not exceed 3, at a time
- 6) A facilitation cell should be established at HEC to help scholars' specific problems that could not be handled at their institutions
- 7) To meet the global requirements and standards the residency period for MPhil and PhD Programs should be raised up to five years
- 8) Improvement in the coordination among the universities and HEC is suggested
- 9) Proper status wise list of HEC Indigenous scholars should be maintained and given on HEC website to enhance job opportunities
- 10) The significant increase in stipend is suggested
- 11) If possible, PhD scholars should be given an accommodation in or near university, so that they may work and visit research labs round the clocks

REFERENCES

- 1) <http://en.wikipedia.org/wiki/Doctorate>
- 2) <http://www.yale.edu/opa/newsr/97-04-21-01.all.html>
- 3) http://en.wikipedia.org/wiki/History_of_creativity
- 4) <http://www.cirp.org/library/ethics/helsinki/>
- 5) www.nichs.nih.gov/research/resources/bioethics/whatis.cfm41K
- 6) <http://en.wikipedia.org/wiki/Reeseearch>
- 7) http://en.wikipedia.org/wiki/Doctor_of_Philosophy
- 8) <http://www.cs.indiana.edu/Academics/graduate/programs/phd.html>
- 9) http://webs.wichita.edu/?u=aero_eng&p=/xaephdprogram
- 10) http://www.hec.gov.pk/HRD/PhD_Programs_Local_Scholarships_Scheme.htm

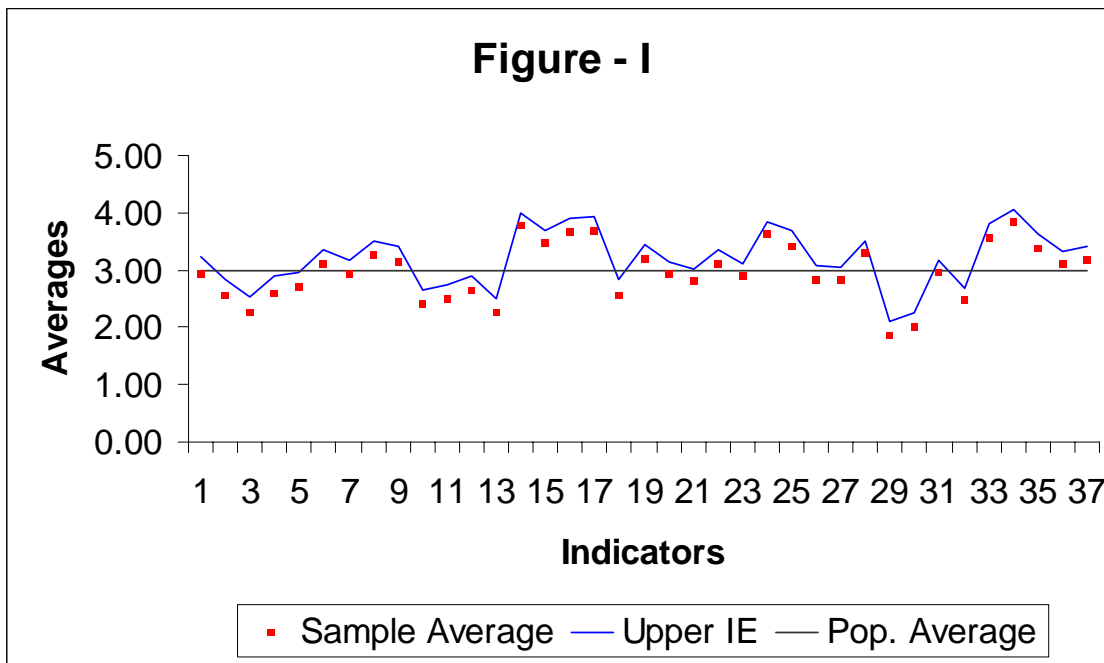
APPENDIX

Table – I: Questionnaire and Survey Results: Ph. D. Program Quality Assurance

Evaluation Scores: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1

	Average	S. D.	C. V.	95% IE	1	2	3	4	5
GRE Subject International:									
GRE should remain compulsory	2.93	1.75	59.69	2.63 - 3.23	32	15	7	12	34
Level / Standard is up to the mark	2.57	1.59	61.89	2.29 - 2.85	9	25	30	20	16
Contents are relevant	2.26	1.59	70.58	1.98 - 2.53	17	29	24	17	13
Time duration is justified	2.59	1.71	66.28	2.29 - 2.88	15	17	24	25	19
Admission Procedures:									
Guidance by HEC is available	2.72	1.44	53.02	2.47 - 2.97	17	29	12	33	10
Admission criterion is appropriate	3.13	1.27	40.76	2.90 - 3.35	6	20	28	34	12
Supervision in the field of interest is available	2.92	1.38	47.17	2.68 - 3.16	18	25	16	26	15
Course Work of 18 Credit Hours:									
Course work is necessary	3.25	1.55	47.76	2.98 - 3.52	22	12	11	27	28
18-Credit Hours are sufficient	3.15	1.55	49.16	2.88 - 3.42	10	12	25	29	24
Curriculum is up to the global standard	2.41	1.43	59.39	2.17 - 2.66	21	31	18	22	9
Presentation of courses are appreciable	2.49	1.49	59.79	2.23 - 2.75	17	22	24	31	6
Evaluation mode is appropriate	2.66	1.41	53.12	2.41 - 2.90	11	23	28	32	6
Courses are research based	2.25	1.41	62.85	2.01 - 2.50	28	27	21	16	8
Research Supervisor's Characteristics:									
Availability is sure on scheduled visits	3.78	1.24	32.68	3.57 - 4.00	6	9	15	37	33
Highly involved in my research	3.48	1.25	36.01	3.27 - 3.70	9	14	16	40	21
Extremely committed	3.66	1.32	35.97	3.44 - 3.89	8	10	16	33	33
Research competency is remarkable	3.70	1.37	37.13	3.46 - 3.93	6	13	15	27	38
Research Material:									
Laboratories are fully equipped	2.55	1.55	60.72	2.29 - 2.82	19	26	14	31	11
Computer / Software are accessible	3.20	1.39	43.39	2.96 - 3.44	13	17	13	42	15
Required Journals are available	2.94	1.24	42.24	2.72 - 3.15	13	29	12	39	6
Relevant books are obtainable	2.80	1.22	43.58	2.59 - 3.01	17	28	18	33	5

	Average	S. D.	C. V.	95% IE	1	2	3	4	5
Synopsis:									
Referee's Reports are essential	3.10	1.42	45.75	2.86 - 3.35	8	12	26	41	13
Approval Procedures are manageable	2.88	1.38	48.01	2.64 - 3.12	8	22	26	34	9
Research Publication:									
Guidance by supervisor is available	3.63	1.25	34.52	3.42 - 3.85	4	13	19	35	29
Financial facility by HEC is available	3.42	1.49	43.49	3.16 - 3.68	3	14	20	35	29
HEC Approved Journals are sufficient	2.84	1.36	48.02	2.60 - 3.07	18	25	19	26	12
Research Activities:									
Seminars are organized regularly	2.84	1.30	45.73	2.61 - 3.06	14	27	19	31	8
Opportunities are available to attend conferences	3.28	1.32	40.28	3.05 - 3.51	8	22	15	37	18
Industrial / Community Links are established	1.88	1.32	70.51	1.65 - 2.10	37	25	24	9	5
Intersiversity links are sound	2.02	1.26	62.47	1.80 - 2.24	33	29	24	9	4
Digital Library of HEC:									
Sufficient number of Journals are available	2.95	1.30	43.93	2.73 - 3.18	10	28	16	38	8
Reasonable number of Books are accessible	2.48	1.27	51.42	2.26 - 2.70	19	31	22	23	4
Evaluation Procedures of Thesis:									
International Refereeing is necessary	3.57	1.40	39.09	3.33 - 3.81	8	12	15	34	31
Open Oral Defense is recommended	3.84	1.26	32.72	3.63 - 4.06	3	6	14	42	35
Ph.D. Program:									
Time allocation is justified	3.40	1.35	39.66	3.16 - 3.63	12	14	10	44	20
Quality of Ph.D. Program is being assured by HEC	3.10	1.22	39.40	2.89 - 3.31	7	19	25	41	7
Financial management of HEC is appreciable	3.18	1.40	44.02	2.94 - 3.42	14	22	14	28	21



List of Indicators

	GRE Subject International:		Synopsis:
1	GRE should remain compulsory *	22	Referee's Reports are essential *
2	Level / Standard is up to the mark	23	Approval Procedures are manageable *
3	Contents are relevant		Research Publication:
4	Time duration is justified *	24	Guidance by supervisor is available *
	Admission Procedures:	25	Financial facility by HEC is available *
5	Guidance by HEC is available	26	HEC Approved Journals are sufficient
6	Admission criterion is appropriate *		Research Activities:
7	Supervision in the field of interest is available *	27	Seminars are organized regularly
	Course Work of 18 Credit Hours:	28	Opportunities are available to attend conferences *
8	Course work is necessary *	29	Industrial / Community Links are established
9	18-Credit Hours are sufficient *	30	Intersarsity links are sound
10	Curriculum is up to the global standard		Digital Library of HEC:
11	Presentation of courses are appreciable	31	Sufficient number of Journals are available *
12	Evaluation mode is appropriate *	32	Reasonable number of Books are accessible
13	Courses are research based		Evaluation Procedures of Thesis:
	Research Supervisor's Characteristics:	33	International Refereeing is necessary *
14	Availability is sure on scheduled visits **	34	Open Oral Defense is recommended **
15	Highly involved in my research *		Ph.D. Program:
16	Extremely committed *	35	Time allocation is justified *
17	Research competency is remarkable *	36	Quality of Ph.D. Program is being assured by HEC *
	Research Material:	37	Financial management of HEC is appreciable *
18	Laboratories are fully equipped		
19	Computer / Software are accessible *		
20	Required Journals are available *		
21	Relevant books are obtainable		

Note: * Upper Interval Estimator is higher than 3.00

** Upper Interval Estimator is 4.00 or more