



# Principal Component Analysis on Higher Education Institution (HEI) Ranking Systems and Conceptual Framework for A New Age Hei Ranking System – Indian Context

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Available online at: [www.isca.in](http://www.isca.in)

Received 22<sup>nd</sup> May 2013, revised 29<sup>th</sup> May 2013, accepted 3<sup>rd</sup> June 2013

## Abstract

When World class universities gain from the momentum of student mobility, countries embark on establishing World-Class institutions. For countries like India, which have immense resources but still on loosing side of student mobility, it is prime time to fine tune the education sector to meet global standards. World-Class institutions must be motivated for a vision of national growth by regularizing the education sector to all in line with the sectors riving national growth and complemented with a reliable ranking system which has market potential enough to reach international students. Measuring quality of Higher Education Institution (HEI) is complex. Blind inference of statistical data may lead to a biased judgment. Too many measures and unavailable data tend to make the Ranking process fragile against the ever growing stake older demands. To establish a world class. The growing interest on measuring effectiveness of Higher Education Institution is testimony to the recognition that excellence is not only about achieving outstanding results but also addressing increasing stakeholder needs and catering specific learning needs of diverse student population. As going by International ranking systems, US, UK, Germany, Japan, Australia and few other countries occupy the top 200 universities. The chance for Indian Universities to make it to the league is very narrow. This paper is in a motive to improve the standards of the Indian HEI Ranking System to foster creation of world class universities in India. The parameters used by HEI ranking systems with international reach are analyzed and are studied against the principal components used by Indian ranking system. Also an attempt is made to list the principal components for a new age ranking system in Indian context.

**Keywords:** Indian university rankings, comparing university ranking, academic quality analysis, measuring academic quality.

## Introduction

Evaluation of HEI has been ever evolving but the concerns on reliability remains the same since the inception of the evaluation systems.

The multiplicity and complex interdependencies of factors and social wave driven stake holder demands tend to reduce the impact of HEI ranking. The complexity of HEI ranking systems is such that an incremental change in a factor may lead to dramatic changes in the ranks<sup>1</sup>.

Looking at the Indian context, the evaluation systems need to be strengthened to help improve the stature of Indian education system. When student migration is considered a prime determinant reluctant of quality of higher education, India is visibly on the loosing end. India is leaking students to the US, UK, China, Australia, Singapore, Malaysia and the list is expanding.

Failure to attract global students can be linked to many quality parameters. This project intends to look into the quality of Indian HEI ranking systems and a trial is made to establish a

Ranking system for Indian universities which will introduce to them the global standards in quality assessment.

The paper is organized as follows: i. Comparative study on the existing Indian HEI ranking systems by doing a Principal Component Analysis. ii. Conceptual framework of HEI ranking system with included new age HEI expectations.

The conceptual framework is designed on the key features of World Class University as stated by the UNO.

Much importance be given to make sure the new age stakeholders need in particular the this proposed ranking system measures HEI through optimal weighted measures of traditional thoughts of academia on Fundamental Research, Consultancy and services, Social Responsibility and Good-will.

**Scope of Study:** The hinge in assessing academic quality is connecting the complexity of the different parameters included and assigning optimal weighting to the parameters and their relationship. The available ranking systems concentrate much on the parameters weighting in the performance of the educational institute in current potential.

The intended conceptual framework assigns weighting not to the parameters but to the complex relationships between parameters. The ranks are computed by weighted sum approach on the weighted parametrical relationships.

### Principal Component analysis

In order to do the comparative study of existing HEI ranking systems we choose the 2 major Ranking systems namely. i. Outlook India, ii. Competition Success Review (CSR) and compare them with the globally accepted HEI ranking systems namely, i. THE- QS, ii. Shanghai Jiao Tong University iii. Asia Week

**Study of Ranking Systems:** Major factors and parameters used for evaluating and rating were Infrastructure (both physical and academic), faculty, and research, edp, consultancy, publications, curriculum, delivery system, patent, admission, placement, entrepreneurship program and industry interface. The

composition, ratio and the output of the faculty were other key factors in measuring qualitative value of the institute<sup>2</sup>.

Different components used and corresponding weightings on each parameter by various ranking systems is furnished in table 1.

**Outlook Express - India Ranking:** Outlook Express ranking systems provides a complete ranking of professional studies colleges in India. The focus of the ranking systems is primarily the infrastructure physical, academic and facilities. Also taken into consideration is the quality of students intake and result based academic performance of graduates<sup>3</sup>.

Detailed measurement parameters and corresponding weights are listed in table 3.

Outlook express has a 13 criteria scale but visibly much importance is given to i. Selection process, ii. Student grooming (Academic Excellence Personality development, exposure and Placements)

**Table-1**  
**List of Parameter used in International University Rankings systems and their corresponding weightings**

Rank	Indicators	SJTU	Times	Asia Week
1	Articles on ISI databases	20.0		3.3
2	Peer View		40.0	20.0
3	Bibliometric citations per researchers on ISI databases	20.0	20.0	
4	Faculty- to – student ratio		20.0	5.0
5	Nobel Prizes and field medals for staff	20.0		
	Publications	20.0		
6	Alumina Laureate	10.0		
	Recruiters Review		10	
	Size of institution	10.0		
7	First year students accepted to total applications			8.3
	Students enrolled to students accepted			8.3
	Median score of accepted students entrance score			8.3
8	International student		5.0	
	International staff		5.0	
	Teachers with PhD			5.0
	Teachers with Masters			5.0
	Median salary for teachers			5.0
	University spend on teachers			5.0
9	Publications in per- reviewed journals			3.3
	Articles presented at international conferences			3.3
	Published books			3.3
	Research Funds			3.3
	Research graduates			3.3
10	Total Spent per student			2.0
	Library spent per student			2.0
	Internet			2.0
	Connection Points			2.0
	Library Spending			2.0

**Table-2**  
**Focus of Ranking systems**

Global Ranking System		
SI No	Ranking System	Focus Area
1	SJTU	Publications and Awards (Faculty, student and Alumni)
2	THE- QS	Research Production (Publications – Impact Factor and Citation Index)
3	Asia week	Intake Student Quality and Publications
Indian Ranking systems		
1	Outlook Express	Infrastructure (Physical , Academic and Facilities)and Quality of Students intake
2	CSR	Faculty Potential (Educational level and Research Productivity of the Teaching staff)

**Table-3**  
**Parameters and corresponding weights as composed in 2012 ranking of Outlook Express - India**

SI No	Parameters	Weight
1	Selection Process	227.3
2	Academic Excellence	213.6
3	Infrastructure and Facilities	206.4
4	Personality Development and Exposure	172.7
5	Placements	180.0
6	Type of Entrance Exams	59.7
7	Application to Selection Ration	50.0
8	Fee Structure	59.8
9	Age/Establishment of Institute	57.8
10	Percentage of students placed	61.6
11	Number of Recruiters	37.3
12	Salary offered in Campus placement	50.9
13	Return on investment on students perspective	30.2

**Table-4**  
**Parameters and corresponding weights as composed in 2012 ranking of CSR- India**

SI No	Parameters	Factors	Weights
1	Infrastructure	Physical and Academic Facilities	22.9%
2	Faculty, Research and Consulting	Faculty student ration, Educational Qualification, Research activities, Publications, Workshops and conferences	35.3%
3	Academic Programs	Admission, Curriculum and delivery Systems	14.7%
4	Placement	Placement Records, Industry Collaborations	27.1%

**Competition Success Review India – Ranking system:** The measurement of CSR is more or less equally distributed in 5 criteria. i. Infrastructure, ii. Faculty Strength, iii. Academic programs, iv. Placement

Parameters and corresponding weights as composed in 2012 ranking of CSR- India is listed in table 4.

CSR – Ranking system relays much on the statistical data. Lesser importance has been given to the complex relations between quality measures<sup>4</sup>.

**Implications from Principal Component analysis:** Principal component analysis done on the major ranking systems followed in India and the global level shows that ranking systems though try to establish a balanced relationships between different identified parameters they try to keep their individuality by focusing on a area that the scholars deem more important<sup>5</sup>.

Different ranking systems have different focus areas. While the raking systems with global reach concentrates on fundamental research and exposure Indian Ranking systems still focus on the Infrastructure and the Teaching potential. The importance of Research productivity is highly under calculated by Indian Ranking systems.

Further breaking up the research productively, The International University ranking systems measure i. Research centers to Lab ratio ii. IPR, Awards, Industry Acceptance iii. Phase II and Phase III testing projects and other industry exposure in campus iv. Quality of publications<sup>6,7</sup>.

Ignored measures of quality are i. Research productivity, ii. quality of exposure, iii. Contribution to the local community, iv. Acceptance of college by fellow academia, Industry and Society.

Unfortunately the ignored parameters are seen as the new age quality measures of Higher education institution.

### Conceptualizing HEI Ranking System

The complexity and interdependency of the parameters and the ignored relationship between the parameters end up in a sluggish academic ranking model.

Identified reasons for ignoring stakeholder needs in ranking systems. i. Unavailable data (Poor data maintenance). ii. Weights assumption without factual data leading to weekly pronounced parameters. (This occurs due to poor judgment of interdependency and relationships of parameters)<sup>8</sup>. iii. Dropping important measures due to lack of practices/awareness in majority institutions (Eg. Limited awareness of IPR, Unavailability of potential staff to develop Curriculum)<sup>9</sup> iv. Forced denial of measures due to refusal/Dilution of data (eg. Fund management, Evaluation process, Research productivity)

As said above HEI quality measure is a complex process. An effort has been made to identify the parameters which are visible and available for measurement and which could help implicate to fundamental measures of the academic system. While concentrating on the NEW Age Educational Policy like Contract services, the conceptual framework also give weighted importance to traditional view of research and academia.

The Parameters are grouped in 6 sub categories viz i. Academic Index ii. Student profiling iii. Staff Profiling iv. Research Productivity v. Infrastructure vi. Governance. Detailed list of parameters is furnished in table 5.

A weighted sum approach can be done on the listed parameters to arrive at the intended ranking system.

**Academic Index:** i. *Quality of affiliation and accrediting* – Ignorance of the stake holders is well used by the HEI to brand their courses with these substandard accreditations. This necessitates the academic ranking systems to consider the acceptability of the accreditation bodies as important as the need to be accredited. ii. *Contribution to Curriculum development*- Lot has been said about the need for tailor made specific courses to help students mould into the field of education but One size fits all model rules education industry. Ability of the inhouse staff to design syllabus to deliver needs of global standards must be included in HEI ranking systems<sup>10</sup>. iii. *Continual Evaluation methods* - When the need for grading student performance is Generic as well as skill specific, it is important to have continual, independent and reliable scientific student evaluation system. The evaluation system should be measured against grading motive and industry acceptability models for similar lines of professionals<sup>11</sup>.

**Student profiling:** i. *Student mobility* – Much has been said about the International student migration. Considering the demographical diversity and varied governance in educational policies in India it is necessary to study the student mobility across districts and states while giving importance to student willingness to retain association with the campus. This is better studied by the demographical significance of received applications and the quality of converted applications. ii. *Diversity in Exposure and Career Growth* - Measured Research exposure, quality of Industrial exposure, Placement records-recruiter profiling, performances in competitive exams, career progress records). iii. *Student retaining ratio* – Quality of HEI is reflected by willingness of the students to continue studies in the campus. Conversion ratio of students in UG to masters and to Research reveals the affinity of students towards the institution. The extent of Social networking available for the students demands educational institutes to maintain relatively high standards motivate student’s interests to be retained.<sup>12</sup>

**Table-5**  
Listed below are identified parameters to measure HEI Quality based on New Age Educational requirements

SI No	Criteria	Ignored Parameter
1	Academic Index	Quality of Affiliation and Accreditation
		Contribution to curriculum development
		Continual Evaluation methods
2	Student Profiling	Student Demography
		Diversity in Exposure and Career growth
		Student Retaining Ratio
3	Staff Profiling	Staff Recruitment Process and Demographical Analysis
		Faculty Impact Ratio
4	Research Productivity	Research Recognition
		Research Effectiveness
5	Infrastructure	Research Center to Lab ratio
		Library Usage
6	Governance	Fund Allocation
		Endowment and Effective scholarships

**Staff Profiling:** i. *Staff recruitment* – Diversity in terms of skills and diversity in terms of demography add to varied inputs to teaching methods. When it is necessary to build a fast paced learning environment it is mandatory to have measured diversity in staff recruitment<sup>13</sup>. ii. *Faculty Impact ratio* – This is the most common metrics. With global standards of 30:1 and Indian standards of 40:1. With much available choices of faculty recruitment it is necessary to value faculty positions against the quality of education, research and consulting value addition that each recruit brings in and the network strength of the recruits.

**Research Productivity:** i. *Research Recognition* – When publications are mandatory for research studies it is now needful to filter publications on the basis of impact ratio<sup>14</sup>. Networking through research and innovative practices is a quantifiable measure that could give the quality of research carried out at the institution<sup>15</sup>. ii. *Research effectiveness* – Insufficient data on project records leads to rejecting this parameter from the HEI ranking system. But a relationship can be devised as a ratio of number of projects to student involvement and to public demonstration of research works through conferences, expo etc. iii. *Measure of active consulting, Phase II and Phase III Testing projects* – Center of excellences are the growing education models. CoE's build curriculum on live projects. Ignoring these parameters will do no justice to HEI offering live project exposure<sup>16</sup>.

**Infrastructure:** i. *Research centers to Lab ratio* – Ranking systems calculate the effectiveness of Labs and the projects done. The new age education policy requires it to be taken it to the next level expecting the labs to function as research centers. ii. *Library Usage* – The inclusion proposed in the project is the usage of library. The footprints and the transactions at library.

**Governance:** i. *Fund allocation* – It is seemingly difficult to get unmanipulated data of fund management. But the governance of the college is pronounced more in fund allocation and fund generation methods. Fund allocation may be relaxed in the primary research but to tighten the filters it must be handled with proper data collection mechanisms. ii. *Endowment and effective scholarships* - Endowments and scholarships reflect the social concern/ responsibility of the institution and the extent to which the institution is valued by the society and the corporate houses. Traditionally these measures are considered value addition as the educational institutes in India get assistance from the concerned social groups only. With globalization influencing education sector any endorsements flowing in beyond social sects endowment and effective scholarships have emerged as a major measuring criteria for measuring the social connection of the institutions.

## Conclusion

Conceptual framework of the HEI ranking system is expandable further as a reference model to foster new age Education Model.

The parameters can be extended to form an accreditation model which could be cross educational vertical.

HEI ranking system which is free from dilution and focus on core areas of development can provide valid data to help build education policy.

In alignment to competition at Global knowledge economy, Countries, both developing and industrial, are trying to establish world-class universities. The hype surrounding world-class institutions far exceeds the need and capacity for many systems to benefit from such advanced education and research opportunities<sup>17</sup>.

On a macro level planning process, it is highly impossible to lay down a relevant system in the absence of a holistic and a reliable measurement system. Further research in this area will help develop educational policy that will have solution to growing Quality concerns and alignment of education sector to sectors driving national growth.

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