Mega private universities in India: prospects and promise for world-class performance

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Several higher educational institutions are now emerging in the private sector, which are much larger than the traditional high performing Government funded institutions like the Indian Institute of Science (IISc) and the IITs. We identify seven such mega institutions and use the bibliometric and financial data from NIRF 2017 to see how they compare with IISc when both research excellence and socio-economic performance are taken into account. Apart from other legacy and perception factors that attract the best faculty to premier institutions, the capital expenditure per faculty per year must be increased by 5 to 50 times as the case may be, before these universities can become attractive destinations for the best and brightest of aspiring faculty.

Keywords: Bibliometrics, comparative research evaluation, mega universities, National Institutional Ranking Framework.

EVER since the first academic ranking of world universities came out, it has been a sore point that no Indian Higher Educational Institution (HEI) has made it to the top 100 in the world. The National Institutional Ranking Framework (NIRF), launched in 2015 by the Ministry of Human Resource Development (MHRD), was India's answer to the multitude of ranking exercises now mushrooming throughout the world, in that it is the country's own system of ranking HEIs using India-specific parameters. The second NIRF rank list came out recently. Five broad parameters are considered for ranking: teaching; learning and resources; research and professional practices; graduation outcomes; outreach and inclusivity; and perception. Within each category several subparameters are identified. A complex protocol is used to arrive at a single number called the NIRF score. NIRF 2017 ranks the Indian Institute of Science (IISc) as the best university in India for the second time in a row using this score. There is some irony in the fact that IISc was not separately counted in the engineering section, as it was the first Indian HEI to make it to the list of top 100 universities, according to the Times Higher Education World University Ranking, for engineering and technology in 2015–16.

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According to NIRF 2017 data, IISc had 447 faculty members and a total expenditure of 1287 crores of rupees during the three-year period 2013–2016. It had been pointed out by Ben Sowter of the Quacquarelli Symonds World University Ranking that to be a world-class institution, an HEI can have up to 2500 faculty members and an annual budget up to USD 2 billion, perhaps having an institution like Harvard University in mind. This translates to a three-year expenditure of approximately forty-thousand crores of rupees. Clearly IISc, like other leading HEIs in India, all of which are Government funded or aided, is far too small in size, scale and expenditure to compete with giants like Harvard University.

A close scrutiny of NIRF data reveals that there are several self-financed private educational institutions that are far bigger in faculty size and far better endowed in terms of infrastructure and expenditure than many Government-run institutions. We focus our attention on seven such institutions. Table 1 compares the seven mega private universities with the bellwether IISc. These institutions have faculty strengths which are 3 times to nearly 6 times IISc's faculty size. Some have budgets (total as well as capital expenditure) to match. However, we also see from Table 1 that on a per capita basis, the expenditures of these universities are still far below that of IISc. We shall now attempt to find out if their research performance as well as their earnings related to innovation activities (sponsored research, consultancy, licensing of patents), matches the IISc figures.

NIRF makes available in the public domain, a wealth of scientometric and institutional data. In this communication, we confine attention to two aspects of research performance: academic excellence as measured by publications, citations and impact from three different bibliometric databases for the eight institutions in Table 1, societal relevance and economic impact of the research as measured by their earnings related to innovation activities (sponsored research, consultancy, licensing of patents), output or outcome at the bibliometric level is measured using a second-order composite indicator, and the productivity or efficiency terms follow accordingly using the input to output or outcome factors. Note that earnings have a recursive amplifying effect: these earnings are always ploughed back as capital as well as operational expenditure.

Savithri and Prathap[1] showed that the research performance of leading higher education institutions can be summarized from the input end to the outcome end using six primary and secondary bibliometric indicators representing the entire chain of activity: input–output–excellence–outcome–productivity. Abramo and D'Angelo[2,3] have recently argued that the use of citation indicators from the bibliometric part (inner core) of the chain to rank institutions for performance must be combined with the productivity and efficiency measures from the econometric outer loop of assessment. This requires the

Table 1. Seven mega private universities compared with the bellwether IISc

Name of the institution	Regular faculty F	Total expenditure 2013–16 (S)	Capital expenditure 2013–16 capex	S/F	Capex/F
Amrita Vishwa Vidyapeetham	1683	1672.31	446.33	0.99	0.27
Gandhi Institute of Technology and Management	1543	883.67	157.59	0.57	0.10
Vellore Institute of Technology	1673	1296.76	121.38	0.78	0.07
Manipal Academy of Higher Education-Manipal	2840	3356.45	196.8	1.18	0.07
S.R.M. Institute of Science and Technology	2893	2314.64	819.22	0.80	0.28
Kalinga Institute of Industrial Technology	1319	959.42	41.03	0.73	0.03
AMITY University	2039	1295.86	645.63	0.64	0.32
Indian Institute of Science Bengaluru	447	1287.09	508.19	2.88	1.14

Table 2. Bibliometric and econometric assessment for the top institution in the university category according to NIRF 2017, namely the Indian Institute of Science at Bengaluru

Institute name	Indian Institute of Science, Bengaluru	
No. of regular faculty	F	447
Spend in crores 2013–2016	S	1287.09
Publication details		
Indian Citation Index 2013–2015	Papers P	334
	Citations C	61
	Impact $i = C/P$	0.18
Scopus 2013–2015	Papers P	7442
	Citations C	40,757
	Impact $i = C/P$	5.48
Web of Science 2013–2015	Papers P	6608
	Citations C	31303
	impact i = C/P	4.74
Total eXergy	$X = \sum iC$	371508.30
Per capita eXergy	X/F	831.11
Per spend eXergy	X/S	288.64

bibliometric core of the chain (measuring output or outcome using bibliometric indicators) to be separated from the econometric part of the chain (the outcome or output to input ratios). The evaluation chain is completed as an econometric assessment, where efficiency of the research production process is represented in terms of output and outcome productivities based on faculty size and budget or annual expenditures.

NIRF 2017 (https://www.nirfindia.org/UniversityRanking.html) gives for all assessed institutions, bibliometric data from three databases, the Indian Citation Index, Scopus and Web of Science. The total number of publications, P reported by the institution and the total number of citations C reported, for the three-year window 2013–2015 are the basic bibliometric data. It also gives the faculty size F and the total annual expenditure for 2016, which we call the spend S. These are all size-dependent or composite indicators of input and output[1–3].

At the inner core of evaluation, we perform the scientometric or bibliometric assessment. A second-order indicator of bibliometric outcome is first computed, and the efficiency and productivity measures which form the econometric part (which can be thought of as the outer shell) is obtained using input measures. It is best to demonstrate this with an example. Table 2 shows the bibliometric and econometric assessment for the top institution in the university category according to NIRF 2017, namely the IISc at Bengaluru. We start with one primary size-dependent input parameter: the number of regular faculty, F. NIRF gives bibliometric data from three databases, the Indian Citation Index, Scopus and Web of Science. The total number of publications reported P, and the total number of citations reported for the three-year window 2013–2015 are the basic bibliometric data. From this, we can compute the impact $i = C/P$, which is an accepted proxy for the quality of the work reported in that database by the institution. Note that P is the size-dependent proxy of quantity of research output, i is a size-independent proxy of quality of research output and C is a composite size-dependent indicator which combines quality and quantity.

A single-valued composite outcome indicator for the research performance of each institution from each database can be computed as the second-order indicator[4] called the exergy term from the quantity (size) and quality (excellence) indicators, $X = i^2P = iC$. We see that X is a scalar measure of total research output. Therefore X/F and X/S are size-independent measures of productivity or efficiency of the institution. This exercise is repeated for the seven mega institutions chosen for study.

Table 3. Performance of seven mega private universities compared with the bellwether IISc

Name of the institution	Research excellence			Socio-economic relevance		
	$\sum X$	$\sum X/F$	$\sum X/S$	Total earnings	Capex per faculty per year	Earnings to Capex ratio
Amrita Vishwa Vidyapeetham	33,753.31	20.06	20.18	199.93	0.09	0.45
Gandhi Institute of Technology and Management	4153.38	2.69	4.70	30.76	0.03	0.20
Vellore Institute of Technology	54,796.62	32.75	42.26	61.27	0.02	0.50
Manipal Academy of Higher Education-Manipal	25,089.44	8.83	7.47	82.95	0.02	0.42
S.R.M. Institute of Science and Technology	37,247.90	12.88	16.09	26.36	0.09	0.03
Kalinga Institute of Industrial Technology	8330.23	6.32	8.68	34.80	0.01	0.85
AMITY University	13,524.33	6.63	10.44	44.28	0.11	0.07
Indian Institute of Science, Bengaluru	371,508.30	831.11	288.64	812.18	0.38	1.60

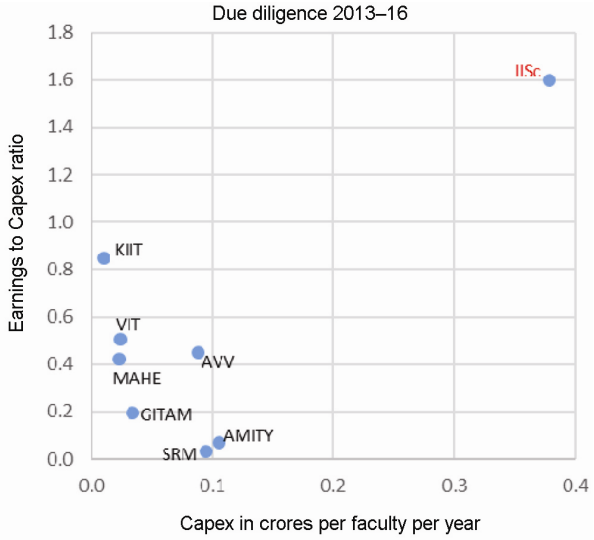

Figure 1. A due diligence representation showing how low capex per faculty traps institutions into a low-level equilibrium trap.

Apart from research output as measured by publications in scholarly journals, it is now expected of scientists and academics to also contribute to the socio-economic sphere in terms of sponsored or contract research, consultancy services and fees from licensing of patents or transfer of technology. Here, we find it meaningful to relate the earnings from these activities to the capital expenditure of the university (capex) rather than the total annual expenditure. NIRF data allows this separation to be made: operational expenditure and capital expenditure are separately listed as part of the total expenditure. For most HEIs, the operational expenditure covers the running costs like faculty salaries, electricity and water costs, maintenance costs, etc. It is the capital expenditure that goes mainly to state-of-the-art equipment and facilities that contributes to the institution's abilities to offer technology services of high quality. Further, capex as reported by NIRF excludes expenditure on construction of buildings, so it has a more direct bearing on research and other productivity as used in this analysis.

Table 3 summarizes the performance of seven mega private universities compared with the IISc taken as a benchmark. There is a noticeable range in size, from an order of magnitude to nearly two orders of magnitude. The research outcome is measured by the second-order indicator[4] called the exergy term X. Here, the IISc is 90 times more productive than the Gandhi Institute of Technology and Management (GITAM). If socio-economic relevance as measured by total research earnings from sponsored research, consultancy and patent licensing is the criterion, the IISc earns nearly 30 times as much as S.R.M Institute of Science and Technology (SRM). If efficiency measures are introduced, e.g. as $\sum X/F$, $\sum X/S$, capex per faculty per year and earnings to capex ratio, again the IISc outperforms the mega private universities hugely. One egregious factor is the very low per capita capital expenditure in these universities – this is as low as Rs 1 lakh per faculty per year. Unless this is raised to IISc levels (nearly Rs 38 lakhs per faculty per year), these universities will be trapped in a low-level equilibrium trap. Figure 1 is a due diligence representation showing how low capex per faculty traps institutions into a low-level equilibrium trap.

We used the bibliometric and financial data from NIRF 2017 to see how selected mega private universities compare with IISc when both research excellence and socio-economic performance are taken into account. It would seem that apart from other legacy factors, the capital expenditure per faculty per year must be increased by 3 to 30 times as the case may be before they can become attractive destinations for the best and brightest of aspiring faculty.

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