

SELF-ACCREDITATION, BENCHMARKING AND LEIBIG'S LAW OF MINIMUM IN THE ASSESSMENT OF HIGHER EDUCATION INSTITUTES

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Abstract: *Higher academic quality is a-priori feature of an HEIs, irrespective of its academic format. While assessing the qualities in terms of objectives of education, accreditors emphasize specifically on some selective parameters extracted through pre-designed indicators on a scale and justify the performance of the HEI. It is expected that a HEI must conform to the goals of the institute in particular and the globe as a whole. Performances in higher accreditation can be improved through inclusive self-accreditation, or benchmarking within the institute on a multiple way of assessment (within or between indicators, parameters, agencies, institutes etc.). A literature survey was done to gather information in this regard. The self-assessment approach has been explained on the back ground of the theory of Liebig's law of minimum (an ecological theory from bioscience). The idea is now presented on a theoretical basis based on integration of parameters to Liebig's law of minimum. The proposal of Calculated Benchmarking Score would provide testable and measurable insights to the idea proposed here. This study proposes a conceptual but executable strategy which can be practiced for improving assessment outcomes of higher education institutes. With institution specific modifications, it can also be applied to other academic institutions.*

Key words: *Accreditation; benchmarking; Ranking; Higher education; Self-accreditation*

Introduction

Referring to the forecast of Bob Goddard, the contributor to the book "*Making a Difference: Australian International Education*", the number of students has been increasing in sharp and steep manner for higher education across the world. Globalization and information technology has brought the world accessible to everyone aspiring for best quality education. In his note in "Massification of higher education revisited", the principal advisor for planning and research at RMIT University in Melbourne, Calderon, Angel pointed that the total number of students in higher education is expected to reach nearly 380 million by 2030, 472 million by 2035, and more than 594 million by 2040, all up from roughly 216 million as of 2016. To cater this challenge, HEIs are now transforming to a competitive mood at the advent of international university ranking tables resulting public perception, student enrolment and staff appointments etc. The sudden shifting of localized and on-campus education to globalized and on-line education has further added tough challenges in the traditional Universities.

Besides, such explosion of learners, there has been a steep change in its importance on education performance on applied terms, cost management, and student satisfaction in higher education and hence the quality criteria of higher education is receiving broader attention from industries, educators and regulators (Chang et al. 1998; Cronin and Taylor, 1992; Guru, 2003; Sureshchander et al. 2002). With the changing need of the society's needs towards its sustainable goals, the quality of education is also needed to be improvised. At this juncture, the higher education plays a significant role in accelerating the society towards sustainable development (Craft, 1993). Incorporation of need-based objectives and expected achievable outcomes has become more a prioritize mission to make a quality academic environment to comply recent social demands at the advent of up to date technologies. This notion goes with Freeman (1993), who says that, there is an increasing need to improve the quality of higher education because education is becoming a global entity facing challenges with resource constraints. The question is how to achieve the desirable quality in education? This, indeed, a classical question for any HEI that aims to set decision making goals through its curriculum. In addition to different assessment frameworks and models, a generalist and measurable

exercise of HEI for quality improvement is highly needed. Variability in quality indicators among external assessors from agency to agency has made it more cumbersome task. The present article, therefore, attempts to outline a basic strategy based on Liebig's law of minimum. This law is popularly known as law of minimum in the field of Bio-science and has direct possibility of application in improving quality education in HEIs.

The accreditation parameters

The first objective of any accreditor is to set the best accreditation parameters. Since, accreditation in higher education is only the key process that attempts to ensure the quality of institutions and their respective programs, its selection of accreditation parameters play the vital role in quality assessment process. This is the reason why, the accreditation parameters are different for different disciplines of education. For any higher education process, a basic 4 to 5 quality classification framework (Table 1) is followed as the foundation to categorize and enlist the accreditation parameters (Green, 1994; Harvey & Green, 1993; Harvey & Knight, 1996, Bobby, 2014; Harvey, 2005; Nicholson, 2011).

Table 1. Basic quality classification framework

Classification	Definition
Purposeful	Institutional products and services conform to a stated mission/vision or a set of specifications, requirements, or standards, including those defined by accrediting and/or regulatory bodies
Exceptional	Institutional products and services achieve distinction and exclusivity through the fulfilment of high standards
Transformative	Institutional products and services effect positive change in student learning (affective, cognitive, and psychomotor domains) and personal and professional potential
Accountable	Institutions are accountable to stakeholders for the optimal use of resources and the delivery of accurate educational products and services with zero defects.

Although a number of classifications have been proposed at different times by various researchers (see review Owlia and Aspinwall, 2023), there exists at least four major classifications and others might be regarded as derived one from anyone of the four classifications. In other words, the accreditation parameters, although in numbers listed under different specific levels, are actually the subset of these four major quality classification frameworks.

Following a broad literature survey, Schindler et al. (2015) extensively listed a range of specific criteria for each component of the above quality classification framework. These are shown in Table 2.

Table 2. Specific quality parameters assigned to basic quality classification framework

Classification	Specific quality parameter
Purposeful	Fulfilment of mission and vision, Transparent aims and processes, achievement of standards, attainment of institutional goals
Exceptional	Credibility, Legitimacy, Reputation, Ranking, Prestige
Transformative	Learner-centred approach, Competency of lectures, clarity of outcomes, Development of critical thinking, student engagement with content
Accountable	Focus on continuous improvement, Sufficiency of facilities, Procurement of quality resources, Student preparedness for employment

These specific quality parameters are evaluated by different accreditation agencies through several quality indicators selected from each range of specific criteria listed. For example, National Accreditation and Assessment Council (NAAC), India emphasizes on total seven groups of key quality indicators as listed in Table 3 below-

Table 3. Seven quality indicators of NAAC (India)

Group	Quality indicator heads	Corresponding basic quality classifications
Criterion I	Curricular Aspects	Purposeful
Criterion II	Teaching, Learning, and Evaluation	Exceptional
Criterion III	Research, Innovation, and Extensions	Purposeful, Exceptional
Criterion IV	Infrastructure and Learning Resources	Accountable
Criterion V	Student Support and Progression	Transformative, Accountable
Criterion VI	Governance, Leadership, and Management	Purposeful, Accountable
Criterion VII	Institutional Values & Best Practices	Exceptional

Note: corresponding basic quality classifications are shown in parentheses. NAAC, National Accreditation and Assessment Council

In case of several other accreditation agencies, the principle of selection of quality indicators remains more or less same (Loukkola et al. 2020). A higher education institute’s performance in all such indicators must be satisfactory to achieve good accreditation score in the evaluation process. In fact, the institute can claim its compliances to socio-academic goals already determined as mission and vision of the institute. However, maintaining a good accreditation score demands balance to all individual indicators. As for example, the NAAC accreditation score is actually a cumulative score

of all the indicators. A poor performance in any one indicator may exert skewed impact on the cumulative score of the overall accreditation score.

Self-accreditation and benchmarking

The objective of this article is to outline a concept on how to achieve the criteria set by most of the accreditation agencies. One of the commonly suggested practices for quality improvement in an organization is self-accreditation (Erwin, 2009; Chi-hou, 2018). Chi-Hou (2018) discussed its advantages in the context of Asia, especially Taiwan. The Taiwanese Ministry of Education, in 2012, launched a self-accreditation policy, wherein higher education institutions were encouraged to develop their own quality assurance frameworks based on strategic direction and institutionally specific features. The attempt of this Self-accreditation policy established positive consequences and outcomes on university's internal quality assurance capacity building. The direct advantage of self-accreditation is that it leads to a benchmarking process – one of the mechanisms to fix targets for each assessment criterion. Since its inception by Xerox company in 1979, benchmarking has been widely used as a tool for quality improvement. In brief, benchmark sets the standard of performance to be achieved. For every indicator of corresponding quality classification, there requires to establish some standards prior working on the quality improvement process. In other words, benchmarking helps in deciding the target as standard. It's a comparative measure, and for numerical indicators, a case that can be compared through chi square statistical test. Self- accreditation and benchmarking are repeated activities practiced till the target is achieved.

The question here is that, how can a continuous self-evaluation process be maintained through a best self- accreditation mechanism? As referred earlier, the self-accreditation approach in Taiwan (Chi-hou, 2018) uncurtailed several challenges like inappropriate selection processes of reviewers, arbitrary elimination of standards and indicators, inconsistency across review decisions in the self-accrediting process etc. In fact, to improve the quality through self-accreditation, HEIs need to follow judiciously the benchmarking standards. Two benchmarking standards may be determined, viz. within and between institute benchmarking standards. In the first case, the HEI determines achievable benchmarking standards from its previous evaluated benchmarking standards. In the second case, the HEI selectively determines the benchmarking stand-

ards of one or more other HEIs where the selected benchmarking standards have performed well in the past. To be more precise, the within benchmarking sets the need for between benchmarking standards.

Liebig's law of minimum and benchmarking

Historically, law of minimum was applied to improve the quality of agricultural practices through increase in essential requirements (nutrients) for higher product of cultivars. It was originally proposed by Carl Sprengel in 1826 to guide use of fertilizer in agricultural practices (Sprengel, 1826), and later on popularized by Liebig (1840). Liebig's law states that the yield of plants in an ecosystem is limited by the element in its least available quantity, which also reflects the actual nutrient demand by that constituent vegetation. As a result, the main objective of an agriculturalist to obtain highest yield from a crop is to find out the element (Input) in its least available quantity. Interestingly, once the element with least available quantity is balanced, another element may become the least available quantity. The process continues till a fully balanced composition is achieved for optimum growth of the crop of interest.

Application of Liebig's law of minimum is observed widely in agriculture management. The best part of this law is that it defines the significance of any nutrient as supplement in comparison to other nutrients. In other words, the possibility of excess input of any particular nutrient for maximum growth of the crop could be avoided, which might have a negative impact on holistic growth of the crop or associated environment at some other point of time. Shortly, Liebig's law of minimum helps in benchmarking among the supplement of nutrients and improve the overall performance of the crop.

The Liebig's law of minimum can be copied to accreditation process for possible improvement of standards of quality indicators. In fact, for self-accreditation, this could be the best tool to act on. The indicators of accreditation may be raised gradually to an equivalent benchmarking level. The term Equivalent benchmarking level (EBL) can be computed from Calculated Benchmarking Score, as follows-

$$\text{CBS of } i = \frac{\text{Escore of } i}{\text{Emax of } i}$$

CBS_{*i*} is the Calculated Benchmarking Score of *i* indicator. For example, the maximum score of Student Enrolment (= an indicator of Teaching – learning and evaluation in NAAC, here *i*) is 10, and if the self-evaluated score of the institute is 6, the CBS *Student enrolment* would be 0.6. The Equivalent benchmarking level for all indicator is 1.0. Hence the self-accreditation may be continued until the indicator of interest reaches 1.0 (Figure 1)

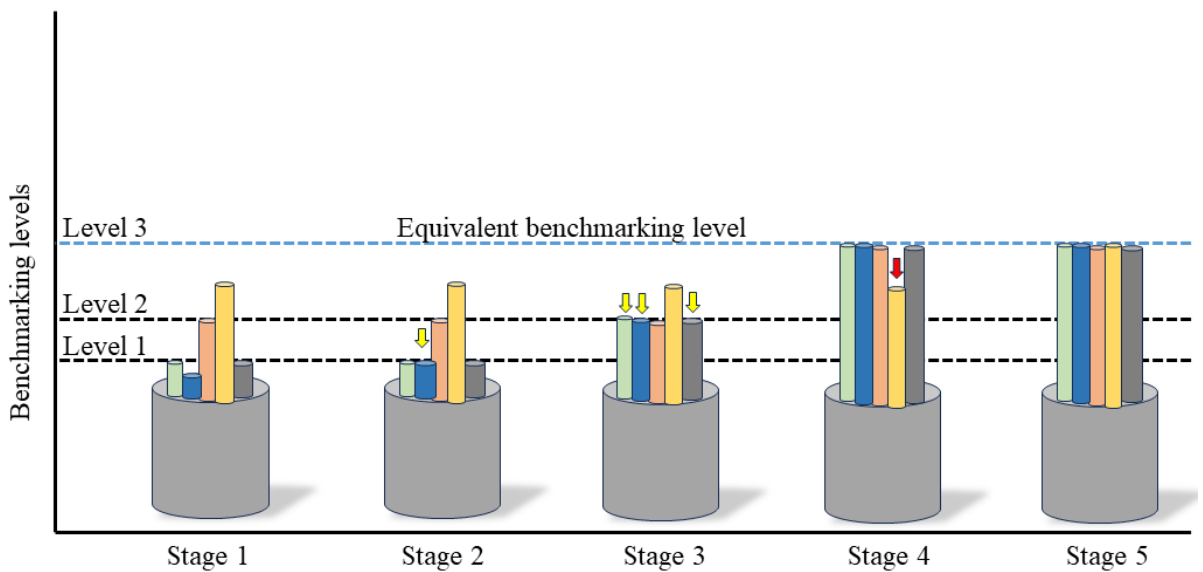


Figure 1. The Liebig's barrel with five different quality indicators (in five different colors). Stage 1: Blue indicator is a limiting indicator for the benchmarking level 1, Stage 2: The blue indicator is now raised (shown with yellow colored arrow mark) to balance with green (light) and ash colored indicators at benchmarking level 1, but all these three indicators are now limiting indicator for benchmarking level 2, Stage 3: Four indicators (except yellow) have been raised (shown with yellow colored arrow mark) to benchmarking level 1, Stage 4: All the four have been raised to equivalent benchmarking level, but the yellow colored (shown with red colored arrow mark) indicator is now a limiting indicator. Stage 5: The yellow colored indicator is now raised to equivalent benchmarking level.

This benchmarking practice may be continued until all the indicators achieve 1.0 as their EBL. Once such practice is over for a particular accreditation agency within an institute, it may be extended to improve quality benchmarking with other similar

accreditation performed within the institute. In this case, the EBL would be the maximum score of the accreditation process to be compared. Most interestingly, the EBL method through Liebig’s law of minimum can be useful in improving the quality of the institute through benchmarking with another similar institute for a particular accreditation agency (for example NAAC). The flow diagram in Figure 2 provides a simple description of such mode of operandi taking NAAC criteria as example. This is obvious that the accreditors have to choose the criteria in a step-up process. In a broader scale, such application of Liebig’s law of minimum may be applied to any scale with some similarity in key indicator or parameters of accreditation. Selection of best accreditation agency could make such effort more productive for the institute.

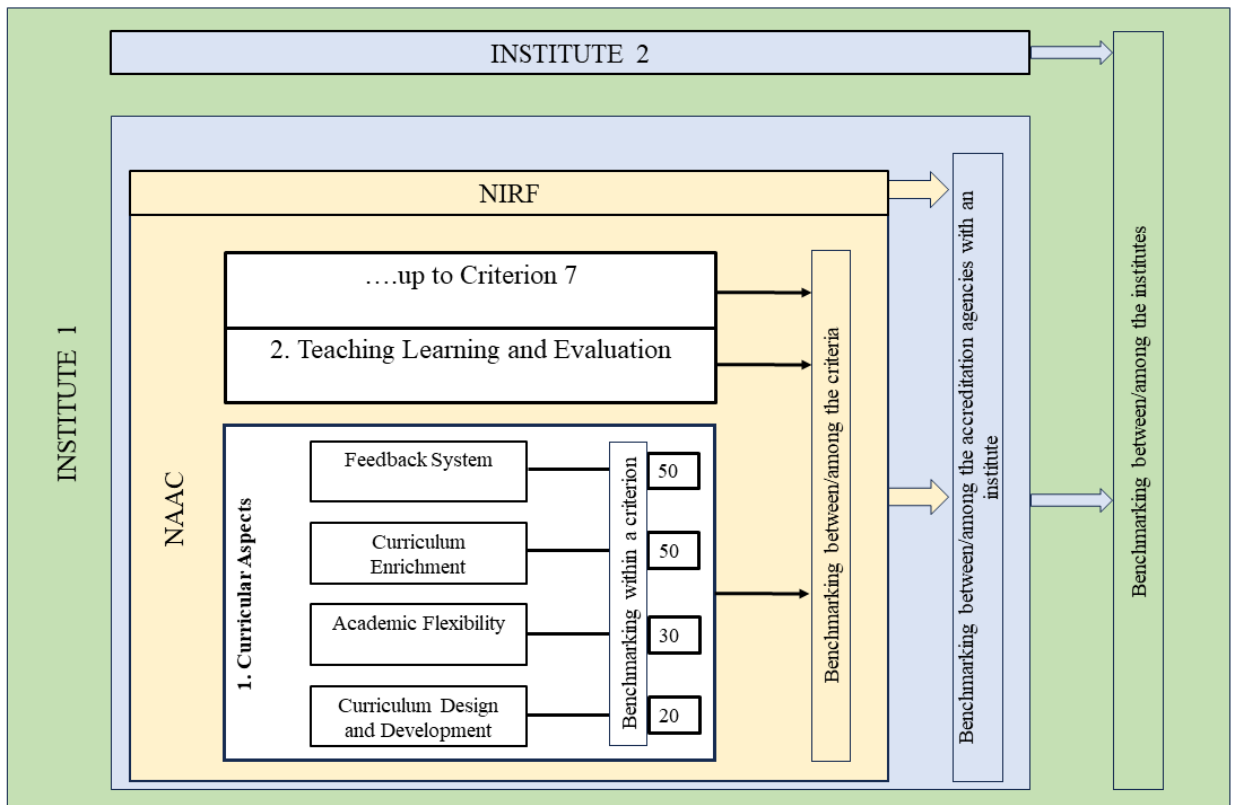


Figure 2. Stepwise benchmarking and improvement strategy. In the first case, the key quality indicators of 1. Curricular Aspects of NAAC assessment are compared (Scores are shown in parentheses). Each key quality indicator is raised to achieve the score shown in parentheses through the process of Liebig’s law of minimum. Once it is over, the accreditation agencies (NAAC and NIRF, in the image) are compared. This is then extended to institute level (between two institute of similar nature). NIRF, National Institute Ranking Framework.

Conclusion

Accreditation is now a necessity for the growth of the academic excellence in all Higher Education Institutes. Among the several national and international accreditation agencies, the selection of best one is a very vital part of decision making for quality improvement. There requires an in-depth analysis on the strength and readiness of the institute before proceeding for accreditation. In such cases, self-accreditation can be an intelligent decision of the institute to affirm expected outcome from the external accreditation. This article clearly explained that following the Liebig's law of minimum for benchmarking within and between accreditation indicators, groups, parameters, agencies and institutes could provide a visible and practical scale to understand the improvement of quality of the institute.

Declaration: The authors report there are no competing interests to declare.

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