

## Environment and Quality Management for the Higher Education Institutions to Achieve Research and Academic Excellence\*

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**Abstract:** Sustainable National Development (SND) is a kind of national development that meets the needs of the present without compromising the ability and efficacy of future generations to meet their own needs. Environment and Quality Management (EQM) in Higher Education Institutions (HEIs) mitigates environment and quality impacts that succeeds to environment and quality education. EQM principles stimulate environment and quality education in HEIs for SND. Environmental Impact Assessment (EIA) process requires multidisciplinary approach that is necessary in providing a prevention mechanism for environmental management and protection in any development. EIA process is designed to identify and predict the potential effects of the physical, biological, ecological, socio-economical, cultural environment and on human health and well-being are adequately protected. International organization for Standardization (ISO)'s 14000 and 9000 standards focus on EQM of all sorts of organizations apart from more than 19500 published standards. Environmental Management System (EMS) and Quality Management System (QMS) have been separately featured in ISO. The article highlights EQM for the HEIs to achieve research and academic excellence. Total Quality Management (TQM) can be broadly defined as a set of systematic activities carried by an institution to efficiently achieve institutional objectives that satisfies beneficiaries at the appropriate time and price. The definition of quality is "The totality of features and characteristics of products or services that bear on its ability, efficacy and values to satisfy a given or implied need". TQM is a comprehensive and structured approach to an educational integrated management that seeks to improve the quality of educational services through ongoing refinements in response to continuous feedback. Thus this standard definition of quality is applicable commonly to both products and services that is stated and unstated. TQM has an important role to play in addressing quality issues surrounding the higher educational development. The objective of the study is to conceptualize EQM on the basis of visiting professorship and expert visits undertaken to twenty five number of Higher Learning Institutions (HLIs) including formulation and appraisal of fifteen number of bankable detailed project reports (DPRs) of Diploma in Entrepreneurship Business Management (DEBM) extension learners of The EDI of India during the research year (RY) 1999-2015 in order to propose EQM for HLIs. The design of the study was cross sectional. It imperative that a policy decision may be taken to

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\* This paper has been presented during the Third World Summit on Accreditation (WOSA 2016) theme titled "Quality Assurance through Outcome Based Accreditation" Organized by the National Board of Accreditation (NBA) during 18-20 March 2016 at Gurgaon (Delhi NCR), Haryana, India and Reference Proceedings Page Numbers 325-337 and Souvenir Page numbers 107 & 177.

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include the multidisciplinary subject of Environmental Impact Assessment Process in curriculum of all the professional courses in HEIs. It is concluded that EQM is a managerial approach centered on environment and quality through beneficiary satisfaction in Higher Education (HE) that succeeds to economical improvement and sustainability.

**Key words:** education, management, quality, sustainability

## **1. Introduction**

EIAs of developments were undertaken in order to protect environment during the year 1950 in Japan, Europe and North America. EIA became an official tool to protect the environment during the year 1970 in USA. The purpose of the EIA process is to encourage the consideration of the environment in planning and decision making process (Larry W. Canter, 1996). Historically, the choice of proposed projects, policies, plans, programs, permits, procedures or legislations was primarily based on only one criterion called economical viability. Today, it is necessary to consider three criteria of economical, environmental and social viabilities for various proposals. Environment coupled with quality management is an intricate managerial approach that was the targeted research area for economical improvement and sustainability based on the triple bottom-line approach (economical, environmental and social feasibility studies) (Iyer Vijayan Gurumurthy, 2015).

After an economic liberalization process, educational administrators of Technical Education Institutions (TEIs) have formulated and appraised the technical education for both the knowledge and skill enhancement and for job. Therefore, technological education momentum has been attained to gain on the basis of knowledge and skill, as well as on the basis of job. Obviously, industries and society have to rely on the graduates who have sufficient theoretical knowledge but lack of practical competencies that included technical skills, entrepreneurial skills, conceptual skills, identification skills, evaluation skills, analytical skills, verbal skills, interpersonal skills and problem-solving skills.

Sustainable economy is a kind of economy that meets the need of the present without compromising the efficacy of future generations to meet their own economy (Iyer Vijayan Gurumurthy, 2015). HLIs are supposed to prepare their students with sufficient knowledge and practical competencies so as to cope with the requirements of sustainable economy. Environment and quality management (EQM) principles stimulate environmental and quality education in higher education institutions (HEIs) to bridge the gap for SND.

## **2. Materials and Methods**

EIA is a predictable process that is devised in to two phases. The first phase is called initial environmental examination (IEE) and the second phase is environmental impact studies (EIS). IEE is carried out on proposed projects, plans, programs, policies, permits, procedures, and legislations in order to determine whether potentially adverse effects with respect to physical, chemical, biological, economical, socio-economical environment and on human health and well being are significant or whether mitigation measures can be adopted to reduce or eliminate adverse environmental and social impacts. Detailed EIA procedure can be called as EIS that was applied to examine the environmental consequences both beneficial and adverse of proposed projects, plans, programs, policies, permits, procedures, and legislations in order to ensure that the environmental and social impacts were taken in to consideration in planning and decision making process (Iyer Vijayan Gurumurthy, 2015). EIA process is designed to identify and predict the potential effects of the physical, biological, ecological, socio-economical,

cultural environment and on human health and well-being are adequately protected. Given below some of the methods and techniques applied during the field visits to twenty five TEIs including formulation and appraisal of fifteen DEBM extension learners of The EDI of India attached with the professional counsellor and co-ordinator.

- (1) Expert judgment and stakeholders' sentiments,
- (2) Check list and matrices,
- (3) Multi criteria analysis,
- (4) Case comparisons,
- (5) Simulation models,
- (6) Software and information system,
- (7) Questionnaires,
- (8) Group discussions,
- (9) Delphi approach,
- (10) Flow charts and decision trees,
- (11) Contingency analysis,
- (12) Overlays,
- (13) Fuzzy logics.

Environment and Quality compliance requirements (EQCRs) have been identified and evaluated systematically in twenty five number of HLIs. Quality Circles (QCs) have been identified and implemented (Iyer Vijayan Gurumurthy, 2011). Quality Management System (QMS) for the institutions to achieve academic and research excellence through TQM has been presented (Iyer Vijayan Gurumurthy, 2015). In the past work, importance of TQM, steps involved for implementation of solid framework in an education sector and few case study results conducted in twenty five numbers of HLIs and fifteen DPRs of DEBM Learners were discussed (Iyer Vijayan Gurumurthy, 2015). TQM comprising of three interlinked modules such as fundamental of TQM, methods of TQM and improvement in TQM. In the present changing environment of the business world, higher education plays an important role in coping up with the updated changes in terms of incorporating the principles of EQM (Iyer Vijayan Gurumurthy, 2015). The evolution of EQM takes place in five stages such as (i) environment and quality inspection, (ii) environment and quality control, (iii) environment and quality assurance, (iv) Total Environmental Management and Total Quality Management (TQM) and (v) EQM. The fourth and fifth stages involve the understanding of TEM and TQM principles. That is applied at every level of the management, every stage, and in every department of the institution, through everybody's participation and continuous process improvement of environment and quality education (Iyer Vijayan Gurumurthy, 2015). EQM is characterized by the following principles.

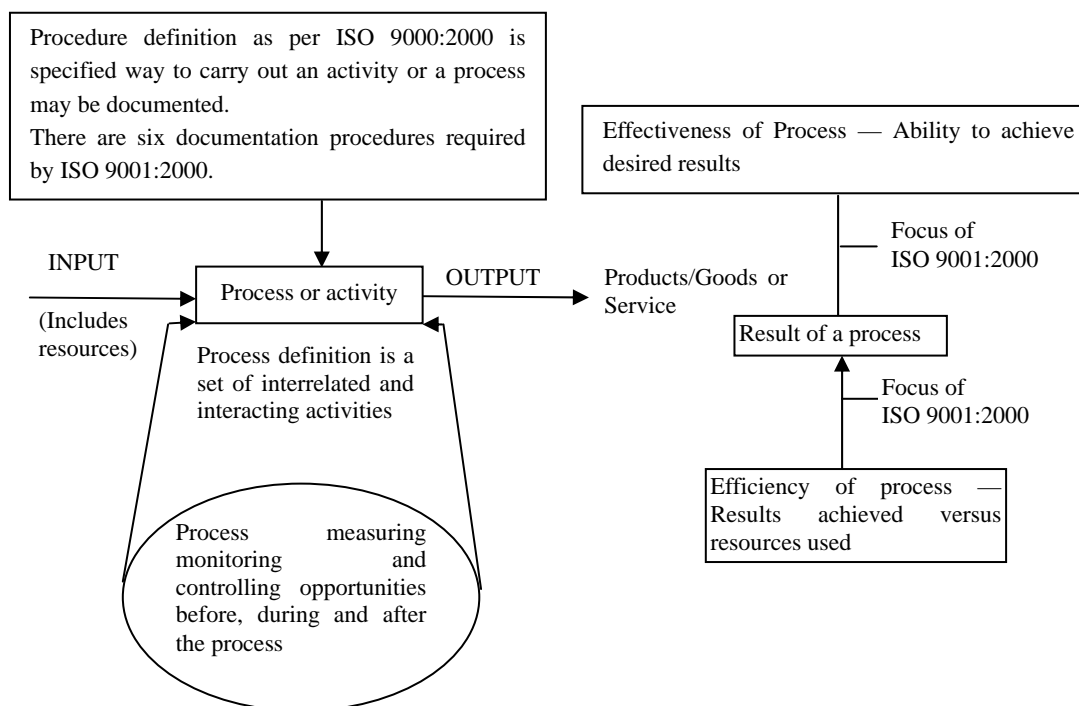
- (1) Beneficiary focused institution,
- (2) EIA Process approach (Figures 1 and 2),
- (3) EQM by process approach (Figure 3),
- (4) System approach to the Management,
- (5) Teacher learning,
- (6) Top management's commitment (leadership) on environment and quality education,
- (7) Focus on the beneficiaries' (students') satisfaction
- (8) Focus on facts,
- (9) Continuous higher education process improvement,

(10) Everybody's participation.

(11) Continuous performance measurement, monitoring and control that is before during and after the process.



**Figure 1 Process approach in Environmental and Quality Management — An Approach of Activity Based Management**



**Figure 2 Schematic Diagram of a Process**

In higher education process, educational values and quality improvement are necessary for realizing the real truth and pursue of knowledge (Figure 3). Education coupled with entrepreneurial process is an intricate sustainable education for poverty alleviation and sustainable development from the emerging enterprises' spirit (Iyer Vijayan Gurumurthy, 2015). The poverty is a result of an inefficient use of resources. If it aids for sustenance then that can be alleviated. To achieve the highest degree of sustainable economical improvement, natural resources have to be utilized at optimum and sustainable levels so as to maximize efficiency as per the result analysis of optimum competitive and social markets (Iyer Vijayan Gurumurthy, 2015). The efficiency of a kind of sustainable economical system is referred in "A.K" sustainable economic model that is the product of engineering or technical factor level (A) and the capital (K). The economical improvement is explained by three factors which are given below:

(1) The natural increase in the accumulation of labour potential,

(2) Capital accumulation or money with which a business is started and run, and

(3) Sustainable technological momentum can be referred as total factor productivity (TFP) or efficiency in industrial process. Such, education coupled with entrepreneurial momentum keeps the capital development dynamic which emerges from the sustainable enterprise creation process, new products or services, new methods

of production and processes, new transportation, new markets and new forms of industrial organization. Standard Production Function (SPF) is expressed as

$$Y = f(C, L)$$

Where Y = Output, C = Capital, and L = Labour As knowledge is an important factor for the economic growth, Standard Production Function (SPF) is modified as

$$Y = A(C, L) f(C, L)$$

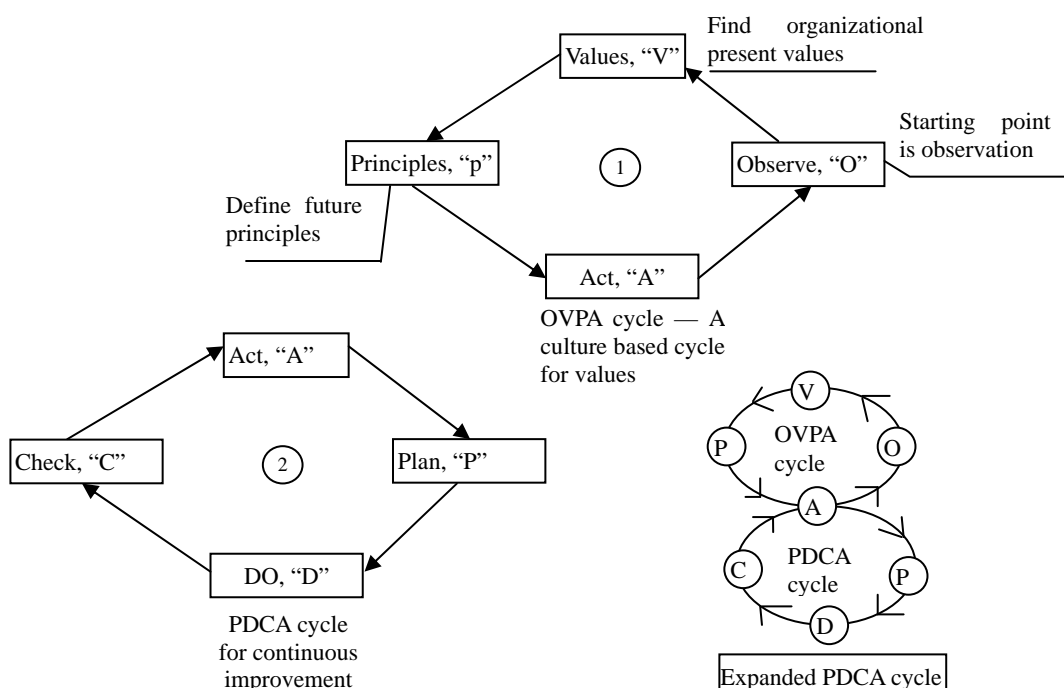
“A” represents Knowledge on engineering or technical factor,

Y = Output,

C = Capital,

L = Labour,

f = Standard production function.



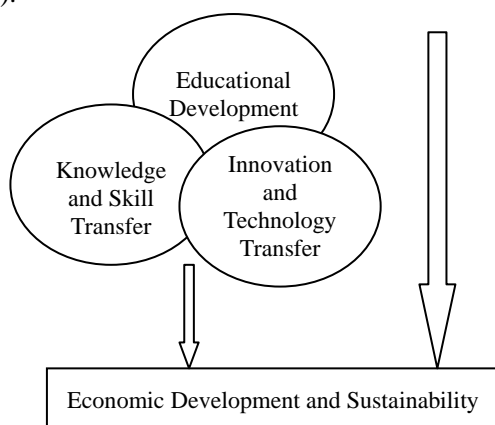
**Figure 3 Conceptualization of Culture Based Environmental and Quality Management OVPA Cycle by Incorporating the Expanded PDCA Cycle for High Education Institutions.**

As per the given standard production function, knowledge is a decisive production variation, optimum innovation level is required in engineering or technical system. The solution is the development of reformed EQM implemented higher educational process (Iyer Vijayan Gurumurthy, 2015).

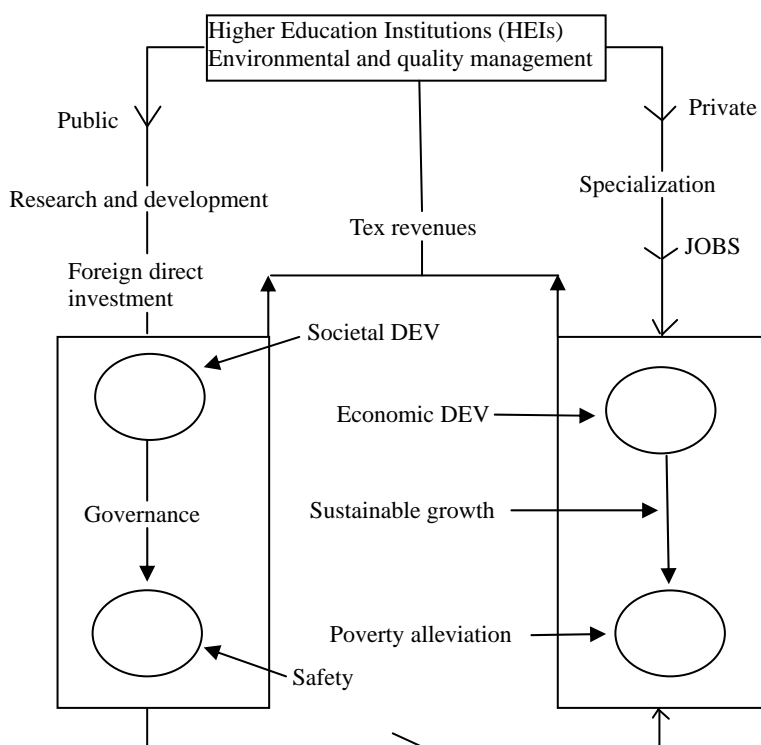
### 3. Results and Discussions

EIA process has been applied that is necessary in providing a prevention mechanism for environmental management and protection in any development. It has been designed to identify and predict the potential effects of the physical, biological, ecological, socio-economical, cultural environment and on human health and well-being are adequately protected. Environment coupled with quality management is an intricate managerial approach that was the targeted research area for economical improvement and sustainability based on the triple

bottom-line approach (economical, environmental and social feasibility studies). The predictions have included all aspects of natural, economical, cultural, social and human environment. An educational statistics study revealed that a student receives one-fourth of education from teacher, another fourth by own intellectual efforts, another fourth from fellow people and the rest in the future course of time through life experience (Iyer Vijayan Gurumurthy, 2015). Sustainable entrepreneur learn entrepreneurial skills through life experience (Iyer Vijayan Gurumurthy, 2015). The subtle relation between education and sustainable entrepreneurship are intricate processes as to benefit more from the emerging sustainable enterprises' spirit (Iyer Vijayan Gurumurthy, 2015). Sustainable entrepreneurial process is set of entrepreneurial activities interacting and inter-relating each other (Iyer Vijayan Gurumurthy, 2014). Given below EQM models presented based on an EIA study for the economic development and sustainability (Figures 4 and 5).



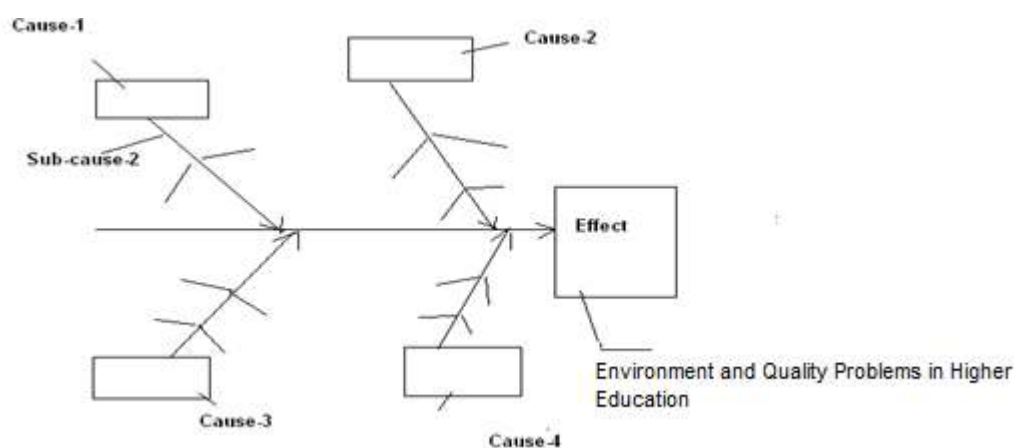
**Figure 4 Conceptual Model of Economic and Sustainable Development on Urbanization and Rural Industrialization**



**Figure 5 Environmental and Quality Management (EQM) System for Higher Education Institutions (HEIs) in Economic and Sustainable Development through Public-Private Partnership Mode**

Quality Circles (QCs) or Higher Educational Process Teams in study areas have been applied to prepare “Total Quality Teachers (TQTs)” so as to incorporate statistical process control charts and statistical quality control charts for improvement of students’ research and academic performance and personality development, entrepreneurship development , efficient teaching and learning process including implementation of various steps to improve academic and research results (Iyer Vijayan Gurumurthy, 2014). Given below a methodology of formation of QC and its functions.

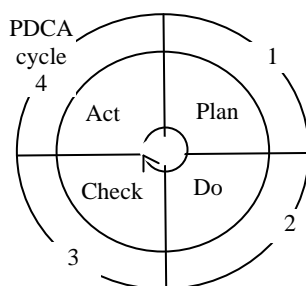
The class committee served as a “QC” for the class. The course committee serves as QC for the course. University and college class committee consist of the concerned faculty, student representatives and a chairperson who is not teaching the classes be formed for each class. QCs meet on a regular basis normally at two-week intervals of time for one or two hour’s duration. Four or five meetings per semester have been conducted. The functions of the class committees are to identify problem faced by the students which have to be taken up on priority. Problems are clarified and analyzed by basic problem solving methods. Solutions for the problems were identified for evaluation. This causes and generates number of possible alternative solutions. Hence, the class committees function towards addressing students’ problem and solution, including assignment of weight age for various course modules of evaluation, identification of weak students and improving their performance, failure mode effect analysis (FMEA) and recommended for necessary corrective action and preventive action by the faculty (Iyer Vijayan Gurumurthy, 2007). The students’ absenteeism was the most common problem existing in HLIs for a long time. By discussion in the QCs and class room using brainstorming and other tools, various causes and the recommended remedies have been identified and evaluated. Late coming was a problem in HLIs. An attempt has been made to solve students’ late coming problem by studying the causes and effects. Steps to improve the academic and research performance have been identified and implemented (Iyer Vijayan Gurumurthy, 2003). Cause-and-effect diagram was applied for analyzing and finding causes of the environment and quality effects based on brain-storming and Delphi methods and the solution sought for the problem (Figure 6). Main sub-causes and causes for environment and quality problem and brainstorming the diagram that are efficient tools for QCs ((Iyer Vijayan Gurumurthy, 2006).



**Figure 6 The Cause and Effect (Fish Bone) Diagram for the analysis of Environmental and Quality Problems in Higher Education Institutions**

Higher education should adopt open, transparent and efficient system so as to produce and supply value added knowledgeable trained human power by means of an integrated educational approach. HLIs identify and

focus on improving areas where they have significant academic and research deficiencies. EQM processes are divided into four sequential categories such as plan, do, check, and act (PDCA cycle) for continuous process improvement (Figure 7). In the planning phase, educationalists define the problem to be addressed, collect relevant data, and ascertain the root cause of the academic and research problem; in the doing phase, educationalists develop and implement a comprehensive solution , and decide upon a measurement to gauge its efficiency; in the checking phase, educationalists confirm the result through before-and-after data comparison; in the acting phase, educationalists document their results , inform others about process changes, and make recommendations for the problem to be addressed in the next PDCA cycle (Iyer Vijayan Gurumurthy, 2013).



**Figure 7 PDCA Cycle for Continuous Process Improvement**

EQM study has been incorporated by three methods, viz. (Larry W.Canter, 1996): Total Environmental Management (TEM), Total Quality Management (TQM), Environmental and Quality Management (EQM) (Iyer Vijayan Gurumurthy, 2015), Peer Review and Evaluation, and International and National Accreditation and Assessment by group of competent educationalists, individual competent persons, or allied institutions (Iyer Vijayan Gurumurthy, 2015). Presented some efficient methods and educational innovations that improved the productivity of faculty and quality of lectures at par with the international academic standards (Iyer Vijayan Gurumurthy, 2013). EQM outcomes from the study in HLIs are given below:

- (1) Identification and evaluation of trained human resource (HR) power potential,
- (2) Formation of QCs or teams in HLIs.
- (3) Specification of faculty workload norms and workload distribution per week;
- (4) Preparation of lecture plans (yearly/semester wise, weekly & daily), lesson action plans for Theory and practice;
- (5) Self-Assessment Report by the faculty for each day's progress (work diary) Table. Reporting weekly summary report by the teacher given.
- (6) Requirements for the structure of the classroom lecture and quality of lectures.
- (7) Methods for preparation of the lecture notes and methods for preparation of lecture notes supplement.
- (8) Computer oriented e.based education.
- (9) Setting up of a Faculty performance appraisal system for the faculty
- (10) Training and development,
- (11) Knowledge and skill development,
- (12) ACADIS (Academic Information System), teaching slots and faculty credit log concepts.
- (13) Sustainable entrepreneurial education,
- (14) Environmental and Quality education of 21st century in HEIs depend upon efficient Inclusion of professional courses Viz., Environmental Science, and Environmental Impact Assessment, Sustainable

Development, Total Quality Management (TQM) and Entrepreneurship Development.

Higher Education research trials have been conducted on EQM in twenty five number of academic institutions including formulation and appraisal of fifteen DEBM projects during the RY 1999-2015 and presented ideas for dissemination (Iyer Vijayan Gurumurthy, 2013). QMS for the institutions to achieve academic and research excellence through TQM has been presented (Iyer Vijayan Gurumurthy, 2013). Education coupled with entrepreneurship is an intricate sustainable educational process that is needed to achieve SND and to eradicate poverty from the emerging sustainable enterprises' spirit point of view (Iyer Vijayan Gurumurthy, 2013). Faculty performance appraisal system for their career advancement was set up well integrated with the EQM principles and led to the potential requirements of individual training and development (Iyer Vijayan Gurumurthy, 2014). HLIs were introduced a system for combined faculty and staff performance appraisal system. The updated performance appraisal reports including complete academic and research profile of teachers such as publication of research papers in journals, paper reading in seminars/conference, publication of books; book chapters, quality of publications viz., citations, science citation index (SCI), citation index database (CID), journal citation index(JCI), conference proceedings citation index (CPCI), research contributions, biographical reference books, patents, innovations, inventions and refereed discoveries (Iyer Vijayan Gurumurthy, 2007). Environmental and quality education represents new knowledge and skill development, innovation and technology transfer, efficient teaching-learning process, beneficiary focus in order to achieve sustainable entrepreneurial competencies, Faculty and staff learning, environmental education, economical improvement and sustainability, and continuous process improvement (Iyer Vijayan Gurumurthy, 2015).

#### **4. Conclusions**

Higher educational service in HLIs is a kind of national and international service that concerns to environment, quantity and quality of education. That is environment in terms of surroundings, quantity in relation to access sustainable education and quality with respect to relevance and degree of academic excellence. EQM mitigates environment and quality impacts in Higher Education that succeeds to environment and quality education. EIA should be an official tool to protect the environment and quality education. EIA process is a multidisciplinary approach that must be necessary in providing a prevention mechanism for environmental management and protection in any development. Planning and decision making process of proposed projects, policies, plans, programs, permits, procedures or legislations should include the integrated considerations of technical or engineering, economical, environment, and social factors. EIA process was designed to identify and predict the potential effects of the physical, biological, ecological, socio-economical, cultural environment and on human health and wellbeing are adequately protected. EQM study has been conceptualized on the basis of visiting professorship and expert visits undertaken to twenty five number of Higher Learning Institutions (HLIs) including formulation and appraisal of fifteen number of bankable detailed project reports (DPRs) of Diploma in Entrepreneurship Business Management (DEBM) extension learners of The EDI of India during the research year (RY) 1999-2015 in order to propose EQM for HLIs. Environment coupled with quality management is an intricate managerial approach which was the targeted area of this research for economical improvement and sustainability based on the triple bottom-line approach. The development of new knowledge is an important factor for the sustainable economic growth. The standard production function has been derived such that the new knowledge is a decisive production variation. TQM has an important role to play in addressing quality issues surrounding the

higher educational development. QCs should be set up in HEIs in order to identify and solve research and academic related problems. EQM principles stimulate environment and quality education in HLIs. It is imperative that a policy decision may be taken to include the multidisciplinary subject of EIA in curriculum of all the professional courses in HEIs. It is concluded that EQM is a managerial approach centered on environment and quality through beneficiary satisfaction in Higher Education (HE) that succeeds to economical improvement and sustainability. Environmental science, environmental impact assessment, sustainable development, total quality management and entrepreneurship development are the basis of environment and quality education for the 21st Century.

### **Acknowledgements**

The author is thankful to All India Council for Technical Education (AICTE) for sponsoring expert visits to TEIs. The author expresses his gratitude to the management of Narasaraopeta Engineering College for providing facilities to publish this article. The author is grateful to Entrepreneurship Development Institute of India (The EDI of India) for attaching fifty one number of DEBM extension learners and to award DEBM to fifteen learners during the RY 1999-2015.

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