The way forward for Excellence in Engineering Institutions through "Education Process Reengineering"

N. Aruna Kumari, D.N. Rao, M.Sudhir Reddy, C. Kiranmai

Abstract— Excellence is a great characteristic of any organization that empowers management to accomplish goals stated from Vision and Mission. The engineering institutions in India are in the way of excellence and striving to meet the Academic parameters by scoring index points set forth by National Statutory Accreditation Authorities. In this situation, the Government of India is also concentrating on pushing the Institutions with great financial assistance to improve the performance and find place among top 100 on Global rankings. This paper focused on the assessment of the situation of engineering education in Telangana and Andhra Pradesh states with specific objectives. One of the objectives is to draw attention to gaps between industry and academia to produce employable graduates. And the other objective is to create concentration on continuous Education Reengineering Process(EPR) as a methodology of change management among engineering institutions which are striving for excellence and to meet standards in National and Global level. This paper represents the review of original research on Process Reengineering in Education Sector to meet the above objectives. And different frameworks of processes are introducing with reengineering methodology, which can implement and evaluate the outcomes in any institution to achieve their vision and objectives.

Index Terms: Education Excellence, Employability, Reengineering, Change management.

I. INTRODUCTION

The major initiative of the plans by the Government of India and many Public-Private Institutions is towards quality and excellence in education sector. India has world's outsized reserve of scientists & engineers, but we have been unable to derive them towards good careers because of the mismatch between industry needs and institution input [Keerthy Menon, 2014]. During the changes of mindsets in new generation students and emerging technology with different merits and demerits are challenging the teaching and learning environment in the institutions. In other hand, companies and industries are struggling to select suitable candidates with required skill set. This situation is effecting higher educational institutions more in Andhara Pradesh and Telangana states compared to other states in India. The reasons for this are state bifurcation, mixed culture and talents, lack of resources on education sector, preferences of

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choosing choices in education, etc. This paper discussed the use of Business Process Reengineering(BPR) tool introduced by Dr. Michael Hammer and Champy in 1993 onwards and widely used in business organizations to achieve radical breakthrough in performance by breaking away from ineffective practices and redesigning processes with the objectives of reducing costs, process time and improving quality. The term Education Process Reengineering(EPR) coined to use this in Education Sector. The importance of undertaking BPR initiatives in the education sector, several authors like Gales(1994), Davis and Mehta(1997), Benjamin (1998) highlighted to improve services in academic and administrative processes. To adopt this tool in Higher Educational Institutions must be in the systematic transformation of an existing system into a new form to realize quality improvements in functionality, systems capability, well-designed educational programs, individual learning and performance. The primary objective of this paper is to present EPR with developed frameworks to steps forward the performance and institutional objectives to become Excellence in Academics and Administrative Processes. The available literature with previous research is reviewed and presented. The developed frameworks presented in this paper have specific objectives and this study is also to support and strengthen the statement that "The student development is only way to develop the Institute as well as Society"

II. LITERATURE REVIEW & FINDINGS

Bianca K.& Peter F. (2004) defined engineering as: 'Engineering is a profession directed towards the skilled application of a distinctive body of knowledge based on mathematics, science and technology, integrated with business and management, which is acquired through education and professional formation in a particular engineering discipline. Engineering is directed to developing, providing and maintaining infrastructure, goods and services for industry and the community.'

Today's highly technical and sophisticated jobs demand a highly professional candidate who can increase productivity and thereby increase the value of an organization [Busse, 1992]. This argument supports the need of layering the industry quality process into the higher education system. Shift from production oriented engineering jobs to service oriented engineering jobs demands professionals with both sound technical and behavioral skills to attain and retain the job (Hillage J, 1999). In this situation, the institutions have responsibility to make students to improve all skills and capabilities along with academic excellence. This leads the

institutional development also. The quality of education is a matter of concern [Dr. Deepak, et al., IIT Bombay]. From the current situations, it is clearly understood that there is a huge gap between the student-teacher ratios. The increase of qualified and experienced teachers is drastically decreasing. The institutions are also not able to make the facilities like laboratories, effective classrooms, learning centres, etc. to fulfill student teacher requirements to create best teaching and learning environment in campus. In fast changing trends in education, 'learning' comes from multiple open sources with wide choice of content and depends on learner capabilities. The educational schools and institutes are on the way to change their methods and techniques of Teaching and Learning to transform the conventional environment as knowledge sharing centers' away from either teacher-centric or student-centric. In this scenario, adopting available sources of novel techniques and methodologies for teaching and learning becomes more creative and strategic.. The assessment of novel methodologies and sources in this paper limited to higher education to give a measure of knowledge and skills of the Engineering students.

EPR is required since the Organization's educational System is under great pressure from Industry or society to deliver such finished graduates from its system so as to be directly absorbed into industry and that too at a mass scale and in a short period of time. For this the system has to undergo a process re-engineering so as to be able to deliver to industry needs. Many postsecondary institutions have recently turned to reengineering as a strategy to meet their challenges [Penrod and Dolence, 1992]. So, the aim of reengineering is to enable the colleges to serve quality education to students with sufficient resources, time and staffing allocation by dramatically improving their processes. Thus the frame work should be applies the discipline of systems engineering process by creating a highly structured methodology. The reengineering process can review the requirements and provide frameworks to have best utilization of available resources and leads to create best resources and campus environment.

III. FRAMEWORKS BY OBJECTIVES & EVALUATION:

The process engineering applies system engineering to process design. A diagram of process engineering is required, A Process design teams and ream roles required to allot and monitor. The implementation teams comprised of members from the Design teams and technology experts. Then develop the detailed process architecture and plan to carry out the implementation of newly designed process. The task of the process engineer is to lead these teams of varied disciplines and fuse their efforts to meet a common goal. The program coordinates and works with the departments of IT services and human resources throughout the program. In process reengineering tract, the first task is to define the parameters of program by describing the environment consultants and resources. With the defined parameters a process map is to be drawn which should describes the organization and relation between major process.

The objectives selected for the framework are as follows:

1. To follow effective curriculum and course structure with continuous evaluation and inspection.
2. To establish the effective teaching and learning process methodology with continuous evaluation.
3. To understand the modes of effective learning by students to introduce the innovative practices to active good attendance and performance in examination.
4. To set up the strong organization structure with research platform reflects the institute and industry interaction.

IV. COURSE STRUCTURE AND CURRICULUM EVALUATION

Reengineering is the systematic transformation of an existing system into a new form to realize quality improvements in operation, system capability, functionality, performance *[Gretar Tryggvason and Diran Apelian, 2006]*

Well-designed educational programs, courses, and individual learning units provide significant value to the learners/students, faculty, and the institution. The value is derived from enhanced academic performance that produces outcomes appropriate to the established educational needs. Compared to traditional educational methods, the re-engineered methods using advanced technology and associated resources can provide major reductions in cost to individual learners, institutions, and society in general.
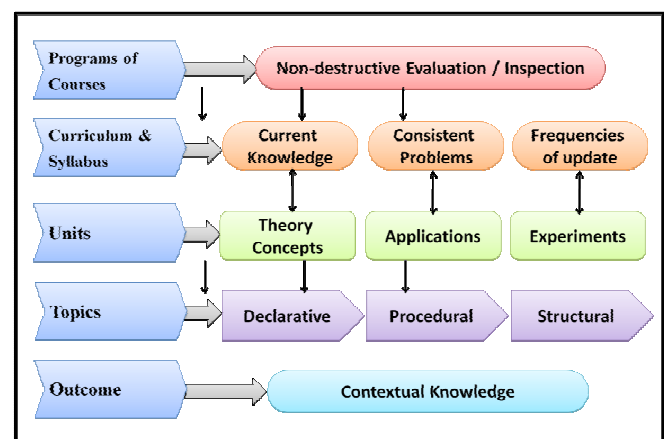

Figure:1 – framework for Course Structure and curriculum evaluation

From the figure:1, the structure defines the non-destructive evaluation of the programs and its curriculum with updated syllabus on regular frequencies. The lecture plan prepared by the faculty should be include the Course objectives and Outcomes to introduce the current knowledge to the students with consistent problems. The units framed by concepts must be clear as theory, applications and lab experiments in the lecture plan itself and need to transparent to the student anytime. Each lecture should frame with the four types of knowledge as declarative, procedural, structural and contextual-base[2].

V. STUDENT TRAINING APPROACHES THROUGH TEACHING AND LEARNING PROCESS

According to the work of Herbert F.W. Stahlke and James M.Nyce, 1996 on reengineering in education sector

concluded that "Successful reengineering in higher education must begin with teaching and learning, rather than administrative processes. Addressing educational processes first will naturally force a reconsideration of such features as the student credit hour, faculty load, space utilization, the academic calendar, course scheduling, instructional resources like technology, and the design of student-faculty interaction. Appropriate selection of a research method is a key issue at the outset of the qualified engineer.
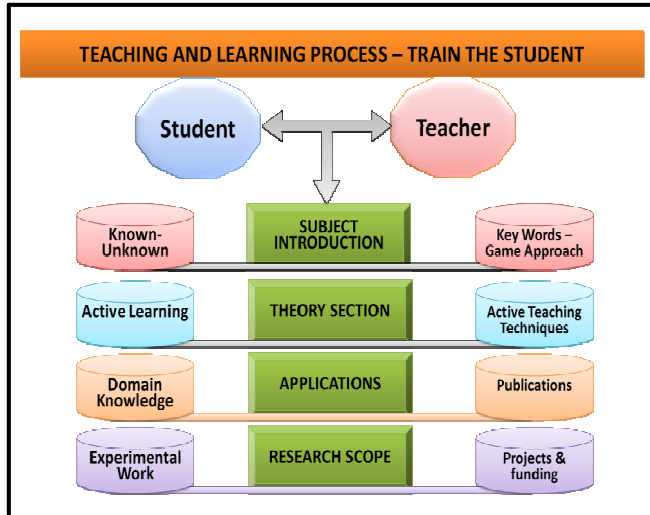

Figure:2 – framework for Student Training approach through Teaching and Learning Process

The strong link need to build between student and teacher is in four levels during the course as showed in the figure:2: Subject Introduction level; Background theory of the subject; Applications of all concepts and Research scope of gap of existing knowledge related to the subject. The relationship between each level build based on the teacher interaction with the students in and outside the class room. During the preparation of lecture plan, an individual teacher has to plan the four levels as shown in the above structure based on the nature of an individual subject. And make the format of teaching plan common to relevant subject teachers.

VI. FOCUS AREAS OF EFFECTIVE LEARNING ENVIRONMENT IN THE CAMPUS

The following framework diagram discuss about the learning modes of students and teachers. The emerging technology allows us to have a plenty of sources for any concepts which include lecture videos, audios, materials, test samples, presentations, etc. E-learning encourages the student to make utilize of TED Talks, NPTEL courses, Course Era, etc. which are providing by reputed educational organizations like IITs, NITs & Universities. Thus, the role of institution and the teacher is gradually reducing on educating student on their selected subjects. But the responsibility is increasing to make the student to have good character, skill set & good career opportunities to contribute society development. Hence, the institution's environment should provide all round development to the student along with education.
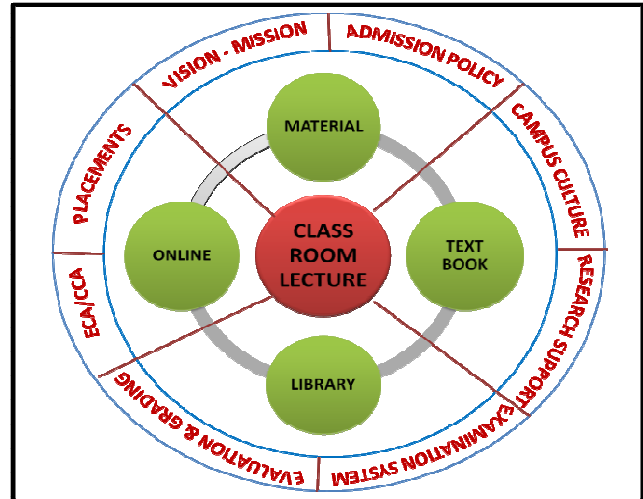

Figure:3 – framework for focus Areas of Effective Learning Environment

VII. RESEARCH ACTIVITIES IN TERMS OF CONSULTANCY, PROJECTS AND REVENUE GENERATION

In the process of reengineering, well established research centre is essential to have the good industry interaction through real-time projects, funds on research laboratories, where faculty and student can work together for best results. The following structure serves the purpose of taking students into higher level on research and innovations by maintaining collaboration with consultancy centre.
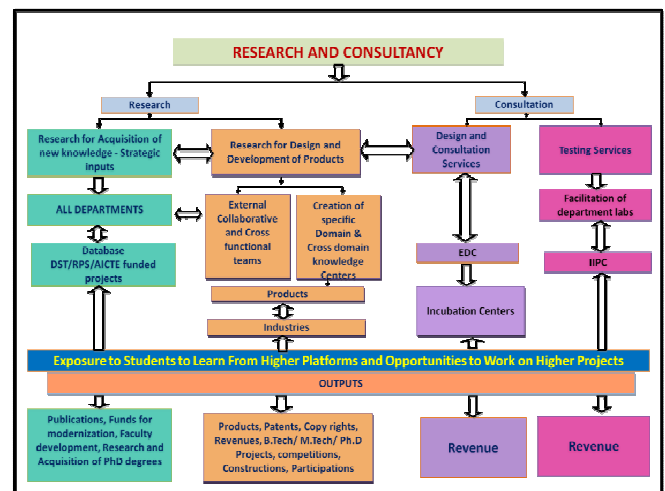

Figure:4 – framework for Research Activities in terms of consultancy, Projects and revenue generation

The perfect interaction of all departments with research centre by taking all student projects to develop with established procedures. Departments should play the major role on bridging the gap between projects development and funding from Government and Private Organizations. On the other hand consultancy wing should have all the testing facilities and centers for Entrepreneurial Development(ED) and Industry Interactions(II). The working incubation centers in collaboration with collaborate with ED & II cells can incubate student worth spread ideas and their projects. This leads both student as well as institutional growth. The final outcome from the implementation of the above R&D structure is to give exposure to students to learn from higher platforms and

opportunities to work on higher projects. Hence, the metrics which are student and faculty publications, funds, knowledge development programs, acquiring higher qualifications, products, patents, copyrights, participations and to know how to generate revenue will lead the institution to higher level.

VIII. CONCLUSIONS & EXPANSIONS

The BPR in business industries focus on quality, speed, low cost, minimum time and customer retention, where as the education institutions have different objectives as producing quality graduates, institutional ranking, revenue generation & social responsibility. Many research outcomes are highlighted facts of framing and implementation of process in unique manner which is not possible for all institutions. And the same time they come up with solutions with process evaluation and identifying problem areas which need reengineering in Management level, Academic level and Administrative level. The implementation of process reengineering as methodology with different frameworks can act as a problem solvers in each stage of failure by thinking of business perspective. This leads to bridge the gap between industry & academia with their unique objectives by using common methodologies.

The following metrics have been acknowledged from the above process frameworks to achieve academic excellence by continuous process reengineering and implementing:

1. Excellence in Academics through non-destructive evaluation of courses & curriculum
2. Teaching with Current knowledge and consistent programs
3. Design effective syllabi with declarative, procedural, structural & contextual knowledge
4. Evaluate Course objectives and outcomes with mapping system for each topic.
5. Identify potential students to train in higher platform with research background
6. Identity slow learner to implement the best teaching-learning techniques to shine them
7. Create and adopt innovation practices into the classroom based on gaming approach
8. Linking the lab experiments to the end in mind to identify domain experimental work
9. Creating research sharing environment among teachers and students
10. Encouraging Teachers as well as students towards research publication and project funding
11. Shared vision and philosophy into deeper levels in the campus will create professional environment
12. Active Incubation Centres leads students and faculty towards entrepreneurship

Future Scope: To discuss the important highlights from the student perspective, on their four year study of engineering education, students' expectations of value and services are rising. They have become more discriminating consumers and also expected value by society. The curriculum followed by the institute and Teacher teaching is firmly control by the universities programs, syllabus and examinations. The future work may carried out to make reengineering process as a unique objective of vision of the institutions and universities to adapt the best process with structure implementations to asses by the university & statutory authorities for quality audits and accreditation purpose.

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