AN EMERGING OPTIMUM MODEL FOR ACHIEVING EXCELLENCE IN ENGINEERING EDUCATION THROUGH QUALITY, INNOVATION AND ENTREPRENEURSHIP

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Abstract— The Engineering Education system has witnessed a plethora of changes in terms of deliverables responding to the continual changes in the social, economical and technological environments. The quality of the education system not only represents the industry ready graduates but also the sociably acceptable engineers with values. The challenges thrown to the students in Indian ecosystem have witnessed many technological innovations owing to change. The change demands technology with transparency. The quality education models with the pedagogical teaching systems open up the opportunities to learners to innovate, experience entrepreneurship. The life skills imbibed in the curriculum makes studnets to experience their own transformation journey and make informed decisions. The campuses are the fertile areas to make this transformation happen. The present research paper focuses on the challenges of Technical education system in Indian scenario. Furthermore, to build a strong Engineering Education, a blend of innovation and quality systems is necessary to achieve entrepreneurial traits among young generation. The idea of implementation is a novelty of a student, which would emerge from the paradigm of the coherent model. The impact of idea must be a measurable result for an organization in terms of startups, incubation cells from the campus

Keywords— *Innovation, Quality, life skills, Entrepreneurship, Change*

I INTRODUCTION

The Engineering education spectrum covers a range of expertise from doctoral degree to craftsmanship to meet social and industrial needs. The sustainability of the engineering education is focusing on the images, values, branding and relative factors of life skills. Competition based thinking is giving a way to an innovation model sharing the value to students, mentors and targeted customers base in mind. The innovation in the project based thinking elevated to the incubation for mentoring and driving the idea to the market. The educational institutions which are aspiring to become world class institutions are developing new educational platforms including, design thinking, innovations and incubations, mentor handhold model, competition thinking, socio solutions and other approaches.

Indian technical education is facing lot of challenges in terms of change, expectations from industry to provide readily absorbent techno graduates with an open mindset and development of creative skills among them. The competition based learning fascinates the learners and provides a chance to work upon innovative ideas. It drives a curiosity which would emerge with divergent solutions. The problem statement simulates to work upon a feasible solution in a conducive environment.

Here, knowledge building and the skill based learning among the team members make them understand the depth of the problem and requirement of infrastructure for the proposed best solution among all the alternatives. The selection of best idea is completely on the basis of analysis, removing all myths and developing confidence. This will remove the myths about innovation and help students to build new solutions in a formal classroom. Innovation is an iterative process. Innovation is taking calculative risks and is the outcome of series of experiments. The innovation centres in campuses have the potential to become the centre of product entrepreneurship under incubation. Project based learning emphasizes on application and integrating knowledge acquired through self-learning or academic learning.

II. INNOVATION HUBS IN CAMPUS.

The school of innovation on campus is a modular concept evolved from thinking of developing the technology and social solutions which contributes to the development of local and in large the national problems. The creativity in the solutions is clearly observed through the solutions which are the advanced forms of existing solution catering to the latest development of the technology or improving the quality in the existing one. A designer mindset is only focused on the opportunities which are the current problems social or economical. Considering the problems in design thinking becomes paradoxical one which becomes attractive.

With the change in mindset from problem to solution we try to create a preferred future. A future where services are liked by the stakeholders. Design thinking is human centered approach to innovation. It provides the cross collaboration to

different teams. It helps in handling the different needs of users like quality, new features and product development.

In design thinking the idea is to provide a rapid development in the large number of iterations. With the advancement of technology the rapid prototyping gives the opportunity to prototype an idea with low cost. This helps the innovation centres to develop a student product which is socially acceptable and affordable. The innovation centres also observe systems thinking approach. The various departments are considered to be embedded in the larger organizational structure and are interconnected. The collaborative approach to develop the institution as the innovative hub proposes the innovation centres to work towards achieving a successful model of innovative approach to develop students as entrepreneurs. The positive motivation would build the right attitude to analyze societal problems.

The technical education focuses more on analytical thinking than on emotional thinking. The biggest challenge of an individual and organization is the factor of failure and lack of spirit to travel in the unknown trajectory. The biggest challenge of an organization is the empowerment of the employees. The organization should empower all the employees to give idea through total quality. The "idea" of the employees towards quality management is either to improve, reduce costs, and minimize waste or proposal of new technology to replace existing solution. The organization should train the employees on benefits of quality improvements through their ideas in the campus. This provokes an involvement and a collaborative approach to the development of organization.

Innovation should be in all the acts of the organization. Innovation should be in all functional areas which could strengthen and accelerate the innovation. We need to have diversity in the departments, in large across the organization. The innovation centres take the forefront in creating internal heroes. The innovation centres could be supported in the initial stage through funds and the sustainability could be observed through students involvement through competition based learning.

III EXPERIMENTATION IN INNOVATION MANAGEMENT.

We need participation of various types of people in the organization for the success of innovation program or to have structured innovation to attain success. To initiate, a team consisting of mentor and student innovators are brought together. The idea is validated through discussions before the next stage of experimentation in innovation management. To prosper in innovative thinking, the team's approach should be to learn failures till perfection is achieved. It is important to motivate the teams towards experimentation despite failures.

The outcome of an experiment is indeed learning. The experiment may not give the desired outcome. The objective of the experimentation process is to design a low cost experiment so as to balance the finances and cost competitiveness. The innovation should create an impact on the cost related issues in the market. The low cost of failure keeps the innovators motivated and promote the innovators keep experimenting and developing the models. The biggest barrier for experimentation is the fear of failure. Hence, ideas should be verified towards the success and expected approval from the market.

IV CO-CREATION OF INNOVATION

The importance of innovation in the current environment is a competitive tool in the present business scenario. It becomes organizational prime responsibility to make better innovation management program. As it is unique in nature, it's the responsibility of the institutions to safeguard the models of institution. The co-creation shall become a tool for creating a value, an image for the institution. The co-creation creates a value which is significant for a user and takeaways of students. The value addition happens as outcomes of the institution. The institution's systematic approach towards the value added activities is the central activity which contributes higher quality productivity.

The meaning value in institutions is intangible. The value creation is the output of series of activities by the organization. The education institutions, being service sectors, need to create a value in use. Values need to be a collaborative approach and jointly application of competencies. The interaction between the industry and the institution being the manufacturer leads to co creation of value. Here, the competencies of manufacturers in terms of skills, knowledge, experience and the expectations of the users are integrated. Different type of users will have different type of expectations. The holistic idea of value creation among students who emerge as graduates from the institutions goes a long way in creating an technopreneur and good citizen to the nation.

The thought of sharing the strength, competencies mutually builds a suitable product which has high value. Co-creation is a process of integration and a reciprocal and mutually beneficial relationship. It provides a platform where communities can be developed. Hence, idea labs become a very important platforms to exchange, build and create a new value to the product. The co-creation is a very important tool for image creation, social connectivity and branding as both institution and the firm contribute in developing the value. The institutions must provide an engagement to the customer in the enabling environment.

V INNOVATIONS TO INCUBATIONS

The shift of focus from knowledge thinking to skill based thinking has given a paradigm shift in technical education. The student innovators are motivated to validate their ideas so as to take it to incubation. Incubation is a protected conductive environment. It is simulation-based experimentation. All innovations should have a backup plan. In an organization the innovation centres must have backup plans to support innovations and experimentations. It helps in time management system of releasing the products to the commercials. For any innovators team, prototyping at a low cost is a must so as to avoid any disaster in the real time market.

The organization incubation centres must be able to support learnepreneurs in terms of deliverables by providing suitable infrastructure. The changing ideas to be experimented and tested towards the desired end result. The most popular

incubations are within the organizations. These incubators normally encourage students, alumini, faculties and also help alumni to develop their own companies. The independent incubators will include people who validate the ideas. The incubation centres may propose a smaller entity within the bigger plant. The important feature of incubators follows the sequence of submitting the idea, validating the idea and mentoring the idea for further maturity. After the validation, the idea will be incubated.

The regular review of the ideas under mentorship effectively makes the incubatees to graduate as a complete entity of their own and thus developing the holistic nature of entrepreneurship in them. The customized incubators can also be created for a particular experimentation based on the competition rolled out for students. The customized incubators can fund, nurture and scale the innovations based on the potential of the project. The campus incubators may connect with the independent incubators that are normally setup in the companies for their employees. The specific programs may be curated and so are the methodologies.

THE SOCIAL ENTREPRENEURSHIP

The human values and social concern at large must be associated with business, marketing and entrepreneurship. Without looking at it in coherence with society we may not be able to sustain what we develop in the campus. The organization offering solutions to the local problems brands as a socially connected educational institution and developing the students in that context gives an edge to the programs run in the institute. The students interactions, surveys with the authorities in the surroundings of the campus helps them to identify the problems of community and develop a suitable solution.

The problem identification perspective is not only philanthropic, but if we can add a dimension of entrepreneurship then the value of the technical education is validated towards the solution being offered. The social entrepreneurship and development of skills in the collaborative model of institutions and industries to bring the deprived to the main stream would be beneficial as the purpose propels the cause associating larger number of people.

VI CHALLENGES AND VALUE BASED ENGINEERING EDUCATION:

Engineering educators must tap into students passion, curiosity, engagement and dreams. We have moved from physical classrooms to virtual classrooms, enhanced learning methodologies, ICT tools, and demonstration based systems to create fun factor and an interest in the research. The effective five tools of experimentation [Hands-ON] are internship, project based learning, competition based learning, industry-sponsored projects, and Government funded projects. These are very essential for capacity building of both faculty and learners. The mentoring by industry personnel for addressing a problem statement is even more effective and vibrant. This would help in divergent thinking to build a product that could be socially acceptable one. The reflections may be assessed with the acceptance by the larger audience and students working on a project to be continued under incubation with a expert mentoring before release of product into the market.

Eventually we are creating engineers who are more introverts and less connected to the society. The human education is becoming more monotonous missing the factor of building harmony in society and in large with nature. The development of co-existence models helps in large to save our natural resources by right understanding in each individual and among people.

The educational openness, the hand hold of students across institutions and global sharing platforms contributing to the idea of creation of global Meta university. A model which is dreamt as a transcendent, accessible, empowering, dynamic, community constructed, framework of web based open materials, and on which much of higher education worldwide can be either constructed or enhanced.

VII COMPETITION BASED LEARNING EXPERIMENTATIONS:

The competition based learning in engineering education has become very popular as it helps in developing an appropriate solution for a problem statement with a organized methodology. These competition based project modules addresses a specific problem may be a local, national or a societal problem in large. The activity related to the challenge creates a curiosity and the knowledge sourcing to emerge with a solution. The interdisciplinary teams bring in divergent thinking on the modules of work related to their domain and would ultimately converge into a final project model. The significance of competition based learning is seen in the outcome of the principles of working of a project built on the concepts.

This competition based learning would create a fun factor as the innovators spend long hours on the project in perfecting the design, building Competency levels, promoting the team work and finally focusing on the objective. Students learn with fun experimenting the ideas, empowering and a meaningful sharing, stimulating, creating a enjoyable work culture, socially connecting and creating a balanced approach towards time and objectives. This approach motivates the students and faculty to impart an element of delight in their learning which make them to come back and connect to the institution for long.

These approaches test their competencies, help them to build confidence and drive them towards participative approach. The program supports self learning and pushes the learners to achieve, excel and beat the odds and to expand the network. They learn effective communication, develop on their negatives, and understand the importance of communication to progress in career The incubation also supports in effective writing skills though writing project proposals for various purposes. With the proper communication skills the incubation of any idea would be elevated through a business planner and enter into a segment.

The pyramid program "**ENGAGE(envision, group, acquire, goal, enter)**"experimented on the competition based learning approach at innovation centre in the campus observed tremendous motivation among the students and a 360 degree

approach to a problem. Competition based learning approach has become popular as an organized methodology in engineering education Learning by taking part in competitions organized by industries like Mitsubishi, Society of Automotive engineers(SAE), asian-ebikechallenge, baja, supra,3Dprinting technology challenge, hackathon are becoming very popular among students. Events like asian e bike challenge are internationally popular for innovations and creativity for self designed vehicles by students. The challenge Mars rovers challenge by rover society was difficult challenge which demanded technical skills, financial support and mentoring so as to build a martian rover which can perform the real time tasks on the mars. The student's real feel is that they learned a lot in building e-bike with innovative features being gearless, long battery life, antitheft, good mileage, and safety norms.

.VIII DISCUSSIONS AND CONCLUSIONS

The key takeaways of the discussion are the engineering institutions, universities make the program as interesting, delightful, adventurous, demanding, socio and empowering the self sustainability than a curriculum based one. The new pedagogical teaching learning method helps in attracting the students to the latest technologies. The new engineering education embedded with values helps creating the advanced solutions to the local, national and societal problems at large. An engineer creates a sustainable living system by offering the human solutions which creates a right understanding in helping people with technological solutions. The present young generation is on the threshold of most exciting opportunities for innovation, experimentation, Promoting technopreneurship in the academia though innovation hubs, promoting the cross functional teams, providing the incubation accelerate the growth of the institution. A holistic approach developed among the students to promote the socio entrepreneurship addressing the existing problems in the society with a human approach.

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