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Blending Engineering Education with Entrepreneurship

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Abstract— This paper aims to develop and test an educational model for teaching entrepreneurship to engineering students based on academic work culture in organizations. The process of defining a program in entrepreneurial engineering, although the early stages of planning, we believe that description of entrepreneurial education upon which program is based on some useful insights into the changing nature of engineering education

Keywords— Entrepreneurship, Innovation, Breakthrough products, Software business, Technological education

1. Introduction

In today's world it is increasingly important for engineering educators to find ways to teach entrepreneurship skills to engineering students. Engineering faculty has done well teaching engineering science and design to students and they have begun to address other skills such as teamwork, ethics and communication. Indian economy relies on innovations and the development of new products and technologies. Economic growth is fuelled by firms that exploit these new developments. However, many engineering colleges not serious about teaching entrepreneurship and faculty often lack the necessary business skills. Colleges can be hesitant to begin new programs because of concerns about accreditation, departmental tenure and the other issues.

1.1.Objectives

- To develop innovative solutions based on technology to address teaching learning issues
- To start a professional service firm in Engineering Education
- Bringing Technology which is successfully tested globally to local Institutions
- To promote Open Source Software tools in Teaching Learning Process to optimize the Total Cost of ownership of the institutions and control piracy issues.
- To supplement regular classes with technical seminars as a value addition programs.

1.2.Need for the Study

- Researchers are too busy in bringing out Technologies
- Companies are too busy in Producing and Marketing the Technologies
- Institutions are signing Memorandum of Understanding MoU with those companies

- Labs are been established, training for faculties have been conducted,
- But… In most of the institutions,
- Students, still learn in traditional way,
- Prepared for passing the exam,
- Trained for getting university rank… and this continues…..

Here we find a gap between:

- What was being claimed and what is being practiced
- Tools being available in the industry and what are being used in the class room
- Open source tools are being discussed are never been used to its potential

1.3.Expected Outcomes

In this study, we intend to find out various entrepreneurship opportunities for engineering graduate students to find a solution to bridge the gap between the Industry and Academia

2. Related works

There is a substantial amount of research on the Entrepreneurship for Engineers has been done both national level and globally, an extensive review of those researches has been consolidated in this section.

Entrepreneurship in Engineering Education

Joel Moses, in their study stats that, "Entrepreneurship Center (Ken Morse) – Brings entrepreneurs together, teaches graduate level subjects in Sloan School and Technical Entrepreneurship for Engineers" [Joel Moses, 2003], he insist on establishing a separate centre for Entrepreneurship development. While [Jahan et al. 2001] created an 8-semester Engineering Clinic course sequence in which hands-on design projects are completed every semester. [Bechard and Toulouse, 1991] draw on a framework from the educational sciences to contrast four educative orientations. Three of these, conformist, adaptive and transformative, are pedagogical approaches which focus on course content. The alternative orientation, as an androgogical approach, emphasises process. The authors suggest that, unfortunately, the pedagogical model is the dominant model in entrepreneurship courses and recommend a transition to the alternative orientation. [Ulrich and Cole, 1987] emphasises the importance of successful learning experiences in generating and increasing interest in entrepreneurship. This is also been stated in the studies of, [Wayne H. Stewart and et al, 1999] The entrepreneurial and managerial domains are not mutually exclusive but overlap to a certain extent. The former is more opportunity-driven, and the latter is more resource- and "conservation" -driven.[Dana, 1987] also suggests that entrepreneurial learning style preferences are consistent with active participation and that increased opportunities to participate in the classroom would increase student awareness and enhance the ability to learn from experience. Dana further argues that the emphasis should be on improving entrepreneurial skill development and on the importance of learning the skill to learn as an ongoing process rather than on traditional management course content. [Ivancevich, 1991], [Ronstadt, 1987], [McMullan and Long, 1987], [McMullan, 1988] and [Plaschka and Welsh, 1990] discuss the emergence of entrepreneurship as an academic discipline and its role within the traditional business school structure. Each highlights the growing body of entrepreneurship literature and systematic theories necessary for recognition as an established discipline. Each also emphasises a particular aspect of the role of entrepreneurship education. [Plaschka and Welsch, 1990] posit two frameworks of entrepreneurship programs. The first combines the dimensions of number of entrepreneurship courses and degree of integration. The second combines the dimensions of number of disciplines and transition stages in a firm. The value of the models lies in their usefulness, individually or in combination, in studying and

designing entrepreneurship programs. [Harrison and Leitch, 1994] argue the need to utilise recent developments in the field of leadership research when studying entrepreneurship. The authors suggest that leadership and organisational transformation and continuous learning are themes that reflect the new paradigm associated with entrepreneurship education. [Hood and Young, 1993] develop a theoretical framework consisting of four primary areas where successful entrepreneurs must be developed. The areas are content, skills and behaviour, mentality, and personality.

Entrepreneurship in current years:

[Raphael Amit and et al, 1998] Venture financing, including venture capital and angel capital financing as well as other innovative financing techniques, emerged in the 1990s with unprecedented strength, fueling another decade of entrepreneurship. [Donald F. Kuratko and Jeffrey S. Hornsby , 1996] Intrapreneurship (that is, entrepreneurship within large organizations) and the need for entrepreneurial cultures have gained much attention during the past few years.[Shaker, 2001] The entrepreneurial spirit is universal, judging by the enormous growth of interest in entrepreneurship around the world in the past few years. [Paul et al, 2001] The economic and social contribution$ of entrepreneurs, new companies, and family businesses have been shown to make immensely disproportionate contributions to job creation, innovation, and economic renewal, compared with the contributions that the 500 or so largest companies make. [Karl , 1997] Entrepreneurial education has become one of the hottest topics at U.S. business and engineering schools. The number of schools teaching a new-venture or similar course has grown from as few as two dozen 20 years ago to more than 500 at this time

Success stories of entrepreneurs:

[Duane and Hitt, 1999] Entrepreneurial entry strategies have been identified that show some important common denominators, issues, and trade-offs. [Robert A. Baron, 1998] The great variety among types of entrepreneurs and the methods they have used to achieve success have motivated research on the psychological aspects that can predict future success. [Rita G. McGrath and et al, 1992] The risks and trade-offs of an entrepreneurial career-particularly its demanding and stressful nature-have been a subject of keen research interest relevant to would-be and practicing entrepreneurs alike

Summary

In all the above studies it is recommended that Courses and Institutions initiative provide a greater role in bringing out Entrepreneurship skills among engineers. In all of the researches collected on bringing entrepreneurship into engineering education, we summarizes as follows: A separate centre for entrepreneurship education needs to be established or semester wise entrepreneurship course can be mingled with 8 semester engineering course. The current methodologies in entrepreneurship courses need a transition to the alternative orientation. It also suggests that entrepreneurial learning style preferences should be on improving entrepreneurial skill development and on the importance of learning the skill to learn as an ongoing process rather than on traditional management course content. The entrepreneurial education has become universal, judging by the enormous growth of interest in entrepreneurship around the world in the past few years. The sharp increase in number of Institutions a new-venture or similar course proves the fact. The success stories of entrepreneurs and the methods they have used to achieve success have motivated research on the psychological aspects that can predict future success which can be a great source of inspiration for coming years in inclusion of entrepreneurship in engineering education

3. Methodologies

To be able to understand and illuminate the relevant perspectives of entrepreneurship education in Engineering education, the researchers has based this study on both quantitative and qualitative data-collection methods.

The methodology designed for the study has been built around a framework model, developed to help structure the rather complex field of entrepreneurship education and Engineering institutions. This

framework model has been the backbone around which the data for the survey has been collected and analyzed, and therefore this section starts by describing the framework model.

An integrated approach to entrepreneurship education The underlying assumption in the survey and in how the researcher understands entrepreneurship in engineering education is that it has the potential to encourage entrepreneurship fostering the right mindset among student as well as providing them with relevant entrepreneurial skills. This will in time have a positive impact on future economic growth, job creation, innovation and wealth generation. Moreover, entrepreneurial skills and attitudes also provide benefits to society beyond their application to business activity.

Although this has been an underlying assumption and one that the researchers never-theless believes in strongly, it has not been within the scope of this study to validate this. But based on this assumption, the survey has worked towards getting under-standing and a measure of:

- ✓ The attributes of successful entrepreneurs
- ✓ Culture of Institutions.

The quantitative survey:

In order to achieve the objectives set out in this study, the researchers have conducted a quantitative survey among their parent institutions. The quantitative part of the survey, the methodology and the choices taken in connection herewith, will be described below.

The general survey which covers questions answered by all institutions regardless of their involvement in entrepreneurship education; and The specific survey which is the part of the survey that has only been completed by Engineering Institutes who, in the general survey, indicate d that they had courses where entrepreneurship accounted for at least 25% of the content.

The questionnaire was developed on the basis of the framework model described above. It has two sections; one for the general survey, and one for the specific survey.

In the general part the questions were designed to establish the type of institution, the number of students and other output-related areas that could be answered by all institutions. The general part of the questionnaire ended with the screening questions where the institutions were also asked to answer whether they had entrepreneurship education, and, if they did, whether they were under or over the threshold mentioned earlier. The specific survey was designed on the basis of the framework model described above. For each dimension and each sub-dimension in the framework model a number of questions were formulated to capture these dimensions.

4. Findings

The survey from the engineering students found that two-thirds of them “agreed that entrepreneurship education would broaden their career prospects and choices.”Another factor in play is the evolving attitudes of students and faculty toward entrepreneurship education. Two-thirds of them “agreed that entrepreneurship education would broaden their career prospects and choices.” Meanwhile, according to a recent survey by the American Society for Engineering Education, about half of faculty and administrators responded that access to entrepreneurship programs is important for their engineering undergraduates. Addition to above observation the study also identified that:

- Attributes of successful entrepreneurs
- Attributes of entrepreneur are diametrically opposed to those of engineering faculty

- Intrapreneurs succeed best in corporations which have a risk-taking attitude (e.g. make sufficient R & D investments)
- Models of successful programs teaching entrepreneurship to engineers
- Culture of a Institute that fosters a spirit of innovation and entrepreneurship
- Partnerships are needed to create an environment for student and faculty innovation
- How can engineering faculty become role models of innovation and entrepreneurship

Till we observed and analysed the above studies, we determine that a successful entrepreneur are mostly academically dropped outs, because new generation of engineers are moulded in such a way to gain high package settlement as well as to frame their position in society. The main reasons are, in most of the educational institutions, the aim is to produce engineer graduates in spite of making them become a leading and successful entrepreneur for the modern society.

5. Suggestions

- Workshops for engineering faculty on principles of entrepreneurship
- Expose all engineering students to elements of entrepreneurship, embedded in curriculum; elective courses in depth
- To make the MoU's more meaning-full the role of industry-Academia has to provide:
  - ✓ Consultation services to small businesses
  - ✓ Incubators, technology parks
  - ✓ Student interns
  - ✓ Entrepreneurs as instructors/lecturers
  - ✓ Industry mentors for students
  - ✓ Continuing education for industry employees
  - ✓ Preparation of students for entrepreneurship or intrapreneurship

6. Future Research

We plan to extend our research by experimenting the above findings with a batch of students, and test its applicability, further based upon its result, the experiment will be further extended to different colleges to analyze its versatility.

7. Conclusion

An extensive work and effort have been put in review of literature, where both Indian studies and global studies in Entrepreneurial development among Engineering Education has been done. Entrepreneurial engineers focus on the what to-do functions associated with filling the front end of the expanding global supplier/customer pipeline. In this capacity, entrepreneurial engineering represents a difficult-to-outsource core competency. Undergraduate and graduate programs in this field can improve the quality and rate of development of entrepreneurial engineers. Entrepreneurial engineering programs frequently include multi-

disciplinary courseware and project activities focused on new opportunity generation conducted in a culturally-diverse environment.

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