Industry Expectations from Academia: Curriculum Development and Implementation in Engineering and Technology Institutions

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ABSTRACT

The development of the Engineering and Technology based higher Education in a nation is mainly based on the industries. The industry based educational implementation and producing the graduates with industry expectations are needed for the country and industry based Technical Education is essential, which enhance the skilled manpower, improving the industrial productivity and leads to the quality in education, life and to the nation. The industry based curriculum is needed for the academia, which enhance the teaching, learning process due to the usage of real world problems. This present paper investigates the importance of industry expectations in curriculum development and the implementation of curriculum with the help of industries for Engineering and Technology Institutions.

Keywords: Curriculum Development; Industry Expectations; Teaching-Learning Process, Implementation.

INTRODUCTION

The technological developments in the manufacturing and related sectors through industries and organizations make the world very competitive which leads to the societal transformations and improvements in the human life [1]. The Engineering and Technology institutions are facing stiff competitions due to the globalization. The industries play a major role in the development of curriculum and related activities. The industries achieve efficiency by generating knowledge and using this knowledge in production. In this way, they achieve an important competitive advantage in world markets. One of the methods for gaining competitive advantage is thought to be university–industry cooperation [2]. Many of the curriculums used in the institutions are not meeting the standards and requirements which are needed for the industry. Highly skilled graduates with high motivation are required for the Engineers which are needed to improve the nation's competitiveness and economic improvement. The industry based curriculum is the answer for this situation. Industry participation is essentially needed for the curriculum development [3,4].

The industry participation in curriculum development is very important for both the industry and academia which gives the way for implementing the strategies needed for the industry. Without knowing the industry expectation, one cannot develop the suitable curriculum for implementation.

The analysis of the requirement is needed for the curriculum development [5]. The curriculum is implemented according to the needs of the industry and stake holders such as students in which the syllabus is a uni-dimensional document, which lists the subject, and contents outline with broad time allocation [6]. The curriculum is to be developed based on the requirements and has been dependent on the many factors, which include the requirement and expectations from the government, the employer such as industry and also the competition between the institutions. The curriculum has to provide the most contemporary knowledge in a particular discipline [7]. The geographical, political and economic needs of the nation also act as the influential factors for the curriculum development [8]. The quality of the engineering and technical national curriculum is based on the extent to which it meets individual attributes, the requirements of the national economy, the needs of society and the future challenges and aspirations of the nation [9].

THE IMPORTANCE OF INDUSTRY COPERATION

Industry expectations are to be implemented in the curriculum development by participation from the industrial managers. Many researchers have studied the curriculum development and their implications. The curriculum developments and its implementation in Journalism and Media Studies are carried out by Jo-Anne Vorster [11] at Rhodes University Grahams town, in South Africa. He has indicated that the curriculum development is an important concern and has to be implemented properly in discussion with the stake holders and industry. The role of vocational technology and how it can be implemented is studied by Wijesinghe [12]. They have asserted that, the improvement in the vocational curriculum is due to the participation of industrialist and related Engineers and Managers. Çetin and Gulzhanat [13] have suggested a model for improving the efficiency of higher education through university industry cooperation. Normally a triple helix model proposed by Dooley and Kirk [14] is used which is the model comprise of university, industry and government. This structure suggests the cooperation of industry and government with higher education institution. In this model, the government can be acted as a facilitator role. By formulating the proper policy framework, the industry can participate easily with the institutions. This facilitates the greater role in implementing the expectations of the industry. The triple helix model [13] is presented in Figure 1. In the present scenario, it is difficult to assess the situation of

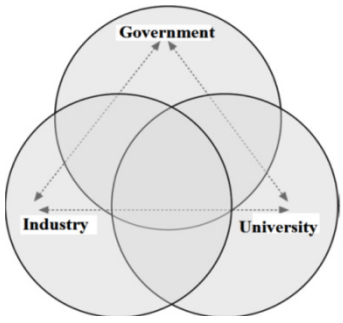

Fig. 1: Triple Helix Model [13]

institute and industry participation in the developmental strategies. The gap can be filled by the government by implementing and mentoring the industries to participate in the development

through institutions. If government policy is employed to bridge this gap, it can be said that the efficiency of both academic and industrial sectors will increase [13].

From the above studies, it has been known that, the industry participation in the curriculum development according to the industry expectation [15-18] is an important one to the stake holders and it also improves the teaching and learning process.

INDUTRY EXPECTATION AND IMPLEMENTATION

The industry expectations are to be included in the engineering education curriculum which is the present day need. The industry expectation is different from the academia. They need different skills from the engineers; it could be achieved only through the participation of industry in framing of engineering and technology curriculum. The industry must be included in the formation and structure of vision, mission and goals. In developing the curriculum, the need for inclusive growth is to be incorporated. The industry needs people with good communication, ability to understand the problem, problem solving involvement and technical knowledge about the problem, self-confidence, personal initiative, willingness to change, etc. [19]. The typical institute-industry curriculum implementation phase is presented in Figure 2.

The traditional curriculum is not suitable for the challenging environment. The practical orientation which leads to the manufacturing is very limited. The traditional curriculum uses class room teaching and laboratory courses using obsolete equipments and machineries, which cannot solve the problem for the industries, whereas the industry expectation based curriculum improves the interaction among the students and has the following improvements (Table 1).

Table 1: Improvements Expected by Implementing Industry Based Curriculum

• Curriculum is framed as per industry expectation • Practical oriented • The students can easily adoptable to the industrial environment • The environment is encouraging and able to learn real time problems • Improves the efficiency and morale of the students • Improve the inter personal skills of the students • The curriculum consists of Internship at industries with real-time problems
• Research and challenging oriented • Funding from the industry leads to the improved infrastructure • Entrepreneurial development • It improves the innovation and thinking mind of the students • Placement assistance

The industry based engineering and technology curricula can be implemented by forming the industrial people and academia as a team. The implementation strategy [20] is provided in Figure 3.

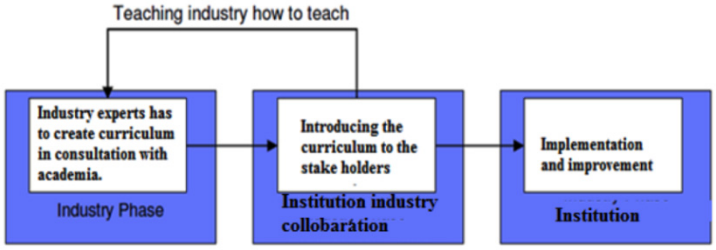

Fig. 2: Industry Based Curriculum Implementation

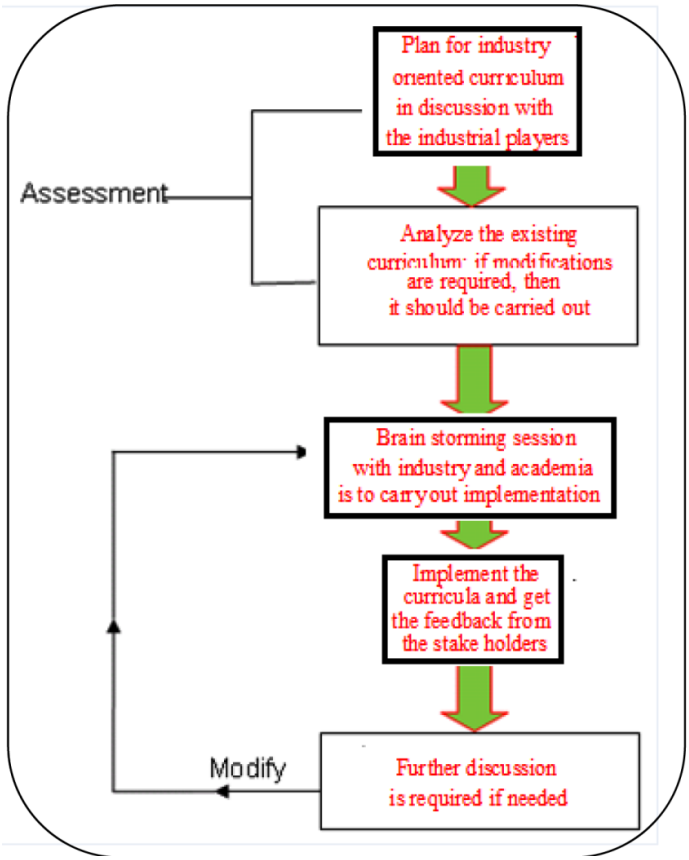

Fig. 3: The Curriculum Implementation

The expectations from the industry are taking into consideration and the curricula can be made and implemented. The curricula include the industry experts as guest teachers, evaluators and experts in the particular subject/field. The curricula developed as per the expectation of industrial experts can provide the necessary skills required for the Engineering and Technology students. The skills include technical ability, design, analytical and other related skills. These skills are to be available to the students within the time frame. The quality of the curriculum should not be compromised. The evaluation of the curriculum developed and the possible success factors availed through the industry expected curriculum have the following as provided in Table 2.

Table 2: Curriculum Implementation and Success Factors

Curriculum Implementation	*Success Factors*
• In process feedback from the students • Initially pilot program is to be carried out and improvement is carried out through the feedback • Survey feedback integrated in the curriculum • Quality of the system/curriculum is assessed by the industrial experts • Through regular project work and assignments	• Improvement in the curriculum • Academic and research support from the industries • Social support from the peer group • Faculty Development • Sharing of knowledge and resources between Industry and Academia • Systematic Institution Improvement

ADVANTAGES OF IMPLEMENTATION

The implementation of Industry based curriculum has the potential to transform the Engineering and Technology institutions into the higher level. The implementation leads to the many advantages for students, faculties and administration. Also it leads to the development of Entrepreneurship and enhance the collaborative research. The following are the different advantages arrived through the industry based curriculum.

Table 3: Advantages Arrived for Industry Based Curriculum

For Students	*For Faculties and Administration*
• Summer internships to enhance the employability • Industry oriented curriculum • Students are job ready • Improved employability • Industry to adopt some students • Alumni mentors for students • Improved students interest and morale	• Faculties are trained by industry experts • Faculties are able to do industrial research • Support for administration • Help in research, consultancy capabilities • Train the faculties in different area • Identification and documentation of best practices • Identification of strengths in research and other activities • Drawing up a calendar with timelines for moving towards various works. • Improved financial stability from industrial Funding
For the Development of Entrepreneurship	*For Collaborative Research*
• Encouraging collaboration activities • System for start-ups and commercialize the research • Monetizing and scaling research and formal knowledge transfer. • Creating a Product Development Cells • Creating a Incubation Cells • Creating a Centers of Excellence • Encouraging sponsored research • Start-Ups incubated on campus • Research oriented projects for students and Faculty	• Joint academia-industry supervisor for research and development • Institute-to-institute collaboration/interaction • Moving towards Innovation Clusters • Use industrial facilities for research, training and development

CONCLUSION

This paper addresses the importance of industry expectation and participation in the development of curriculum and implementation. Also it discusses the strategies, success factors and advantages. From the discussion, the following conclusions are drawn:

- The industry expectation and curriculum development is discussed. The implementation of industry based curriculum improves the student's ability in many aspects and paves the way for future.
- The institutes are able to prepare their students with industry ready by applying this concept.
- The practical knowledge of the students are improved. The industrial curriculum leads the way for the students to undergo summer internship and real time projects.
- The industry based curriculum has many advantages for the all concerned and it develops very good ambiance for collaborative research and entrepreneurship.

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