

QUALITY ASSURANCE IN TERTIARY ENGINEERING EDUCATION & SUGGESTION FOR IMPROVEMENTS IN THE 3rd WORLD COUNTRIES

Soma Chakraborty¹, Shyamal Kanti Biswas² and Md. Maruful Islam³

¹Department of Mechanical Engineering, DUET, Gazipur-1700, Bangladesh

²Ahsan-Ullah University of Science and Technology, Dhaka 1208, Bangladesh

³Department of Electrical & Electronic Engineering, DUET, Gazipur-1700, Bangladesh

¹soma_me@duet.ac.bd, ²skbcuet@yahoo.com, ³maruf_kuet_eee@duet.ac.bd

Abstract- With the rise of competition and also along with the new developments in Technology, concern about the quality of goods from industries created a huge cry in the industrial world, thus implementation of ISO for quality assurance of products is now a much discussed subject to all. We know universities too are producing graduates and thus quality control particularly in Engineering education should not be neglected and should attract the attention of the decision makers. In the third world countries either many educational programs are not accredited or much attention is not given for quality control in education. This paper discusses the scenario and problems of quality Management with reference to accreditation or implementation of ISO in education in general and particularly in Engineering Education in the third world countries like Bangladesh.

Keywords: Quality Control of products, Engineering Accreditation processes, ISO in education

1. INTRODUCTION:

It is heard that in 3rd world countries accreditation or educational quality assurance program is given less importance sometimes. Many university degrees have not yet been granted accreditation in this region's universities by international organization or forum like Washington accord, ABET, ISO. Particularly students should get accredited degrees in Technical subjects like engineering, medical Science, Agriculture, and also in some general science subjects as in many cases their work is related to health & safety of mankind directly. Many of the universities in 3rd world countries are ranked quite low by international ranking agencies. For example BUET and Dhaka University are highly respected universities locally in Bangladesh but their international ranking scenario too is not that impressive [5].

Whatever might be the cause, it is true that these universities at least have lacking in some criteria of ranking. Local Ministry of the Government, University Grants commission or some related Government organizations might consider or give certificate about the quality of the university or the degree they offer but the students need to fight in international market for service or for higher studies in this age of globalization.

So, proper attention is to be given about the quality assurance program in educational institutions like that in industries. Proper importance to quality assurance of engineering degrees (like products from an industry) should be given by all concerned. It may be mentioned that university

graduates can be considered as products from an (educational) industry like raw materials (students entering as freshmen) are gradually converted into products (graduates: after the elapse of predetermined time period and following prescribed rules and regulations and course - curriculum etc.) by following a prescribed predetermined process of conversion. So as the products to be sold in the market need to be assured in quality and so is the case with university graduates.

2. QUALITY ASSURANCE IN ENGINEERING EDUCATION

The challenges and opportunities in the profession can be generalized to all the sciences and professions, but in our opinion, Engineering Education is facing the biggest challenge because the engineers are always affected by the emergence of new technologies, and this of course puts universities and scientific institutions and professional associations in front of a big responsibility. The new challenges impose the need to improve the capabilities, and opportunities of Engineers. Then Engineers must have solid scientific background, capable of innovation, familiar with the economic and social factors, with multi-skills, ready to accept change, able to work in a team, and accepts retraining schemes as well as long life learning.

Engineers must be capable of learning new skill in fast and discrete way to meet the ever-changing requirements of their employers. Educational systems should offer courses based on e-learning models using web based

tools. These courses should be offered to the practicing Engineers and should be “on a need basis” taking into consideration the Engineer’s specific needs for new knowledge and skills [1]. In a word, we can say, learning process is always a nonstop process.

This leads us to the following main points in the design of engineering programs:

1. Design versus Analysis: We need to integrate the theories of probability and statistics, numerical analysis and some mathematical skills and computer engineering software.
 2. Communication skills: integrate communication skills both written and oral in the curricula of engineering with practical training.
 3. Team Work: activate science clubs and contribute to the building of the integrated personality of the students through extracurricular activities and to make it receptive to working with others and be receptive to head the head and affects and is affected with others effectively.
 4. Solid Basic and Engineering Sciences: some try to reduce this part which may have a negative effect on the qualifications of the Engineer.
 5. Importance of other sciences: The Engineer should be familiar with other sciences, like information and management systems, and the economy and some social sciences and humanities. This helps the Engineer to be more observer and capable of absorbing the problems.
 6. Professional Ethics: are important in engineering practice especially in considering practice laws.
 7. Close cooperation with Industry: it is essential to establish a close cooperation between faculties of engineering and industry in order that they may both participate in the engineering education and training.
- Edward Sallis identifies four quality imperatives of an educational system shown below in Fig. 1 [2].



Fig.1: Edward sallis’ 4 quality imperatives of educational system

Aikens also identifies three main drivers for quality in education: accountability, alignment and assessment as summarized below in Fig. 2. Both Sallis and Aikens argue that quality management theories should be applied in the educational setting to ensure quality in education while understanding

the complex nature of education compared to for profit institutions.

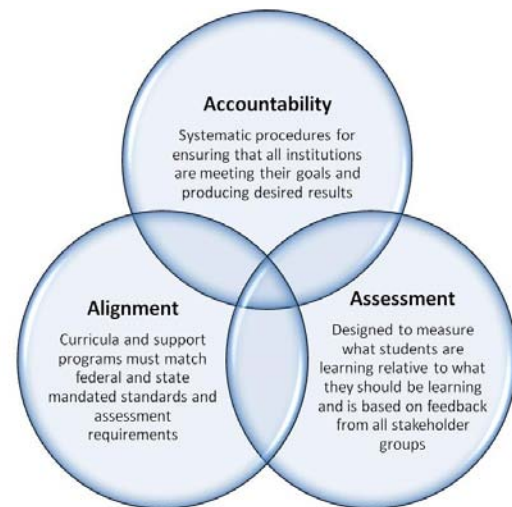


Fig.2: Harold Aiken’s 3 drivers for quality in education

3. UNIVERSITY INDUSTRY RELATIONSHIP

Today, customers expect quality in all aspects of their lives. Companies are re-engineering to assure the customers of high quality of their products and services. In light of this fact, education is no exception. The customer wants to be assured that educational institutions provide quality service. S. Karapetrovic et. al explain the university management system with the following diagram [3].

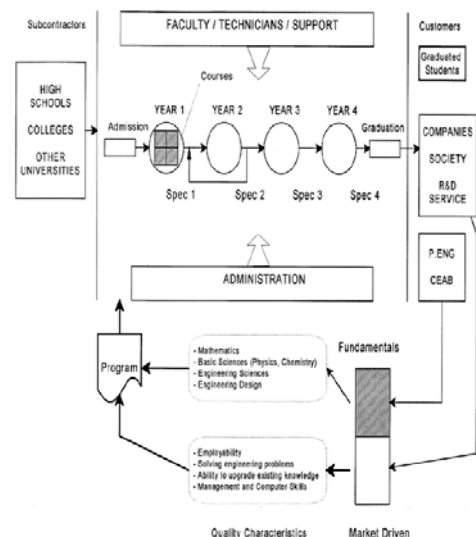


Figure 3: The University Manufacturing System

4. PROBLEMS AND SCENARIO OF IMPLEMENTATION OF WASHINGTON ACCORD, ABET:

As we all know that with the Globalization and Liberalization there is a spur in movement of manpower and especially technical manpower from one country to another country. In this scenario it becomes

necessary to establish a international mechanism where some minimum acceptable level of quality of technical qualifications and thus standards of pass outs are ensured. Washington Accord is a very right step in that direction. And Asia should take advantage of this as we are one of the largest exporters of technical manpower to different countries whether it is America, Europe, Australia, Middle East, Far East or Africa [4].

The most important clause of Washington Accord, which is the first clause to which signatories have agreed, is “The criteria, policies and procedures used by the signatories in accrediting engineering technology programs are comparable”. Every word of this clause puts a challenge for us. It means that criteria for accreditation, which means standard for curriculum, faculty and staff, Learning Resources, including laboratories and libraries etc. should be at par with developed countries such as US & UK etc.

This would require huge amount of financial investment in labs and libraries. Another key issue which this clauses raises is that of criteria for faculties and supporting staff being adopted in advanced countries. For this we have to increase the number of faculty and enhance their quality both simultaneously. This is the biggest challenge which we are already facing [4].

This problem is compounded by the fact that, the Engineering Education is growing at unprecedented pace and there is a kind of virtual explosion as far as number of engineering colleges/universities are concerned. In this scenario it is becoming increasingly difficult even to find candidates holding Post Graduate Degree in Engineering. Finding suitable Ph.D. holders is definitely more difficult task [4].

In this situation it has become necessary to have a well thought action plan to create physical and human resources required to satisfy the demands of “Washington Accord”. So that we can, prepare well to become permanent signatory of Washington Accord as early as possible.

However, the Washington Accord does not cover most part of the world, specially the Europe. Washington accord covers mainly the English Speaking countries such as USA, UK, South Africa, Australia, Canada etc, off course Japan is also its signatory. So if we want to cover all parts of the world, we may also require to sign accords other than Washington Accord. Another important feature of these standards and guidelines are that students should be assessed using published criteria, regulations and procedures which are applied consistently. This would require major reforms in our examination system. These standards also demands that performance and professional development activities undertaken by faculty should also be reviewed.

Board of Accreditation for Engineering & Technical Education (BAETE) has been established by the Institution of Engineers, Bangladesh, the sole professional body of graduate engineers in Bangladesh, which has around 20,000 members, who are now eagerly waiting for global recognition of engineering degrees that would enhance their global mobility [4].

The Board is an autonomous body, independent of the Institution that examines and accredits Engineering degree programs in Bangladesh. Board evaluate whether programs in engineering education conducted by institutions of higher education such as universities reach the levels expected by society and accredit those programs that reach such levels [4].

Albeit Accreditation Parameters & their Weightages that are considered in Bangladesh may need a further thought, it needs to be mentioned that even in the oldest and most reputed local Public General University, Dhaka University in the Dept. of Applied Chemistry & Chemical Engineering under the Faculty of Engineering & Technology, the modern concept of Engineering Course Curricula is followed here since eighty's though the University is Non-Technical. As for example to obtain a graduation degree in Engineering, besides courses of Chemical [4] Engineering and Technology, students have to take courses of Physical Sciences like Physics, Chemistry, Mathematics Industrial Economics, and also other related courses from other disciplines like Psychology & Management, Computer Science and Engineering, Environmental Engineering and also course that incorporates study on Sustainable Development, Energy Conversion Engineering & Environment, Fluid Mechanics, Fuel Technology and Petro-Chemical Synthesis, Solid Geometry & Engineering Drawing. Physical Training and Student's Counseling are also to be undertaken by the students. High importance is given in the course curricula to include Process Technology, Industrial Tour and Training in every year and as such Industry-Institution Interaction is given a high priority. Students also have to take Projects on Contemporary Scientific and Engineering Problems and also carry out Thesis which is publicly defended before the Examination Board through Power Point Presentation. Though the official language in Bangladesh is Bengali but the medium of instruction here is English and this with other co-curricular activities like Seminar, conference, Workshops, Debating, etc help students to enhance their Global Communication Skills in international language of trade. Students from here are doing quite well globally. However, even in some purely technical institutions, with exception of Bangladesh University of Engineering & Technology (BUET), the oldest and most reputed technical institution of the region, course- curricula in line with the modern conception of Engineering education, may need a revision, and the policy of recruitment and the inherent outlook of the teaching staffs and, also that of the respective authorities need to be changed [4].

4.1 Engineers Mobility Forum

Bangladesh is a Provisional Member of International Agreements: Engineers Mobility Forum (EMF). The purpose of EMF is to establish and maintain an International Register of Professional Engineers and facilitate their international mobility. Bangladesh Professional Engineers Registration

Board (BPERB) requires that applicants for P. Eng. (Professional Engineer) status should have an accredited degree (recognized by BAETE).

EMF full members are: Australia (IEAust), Canada (CCPE), Hong Kong, China (HKIE), Ireland (IEI), Japan (JABEE), Korea (KPEA), Malaysia (IEM), New Zealand (IPENZ), South Africa (ECSA), United Kingdom (ECUK), United States of America (USCIEP).

EMF Provisional Members are: Bangladesh (BPERB), India (IEI) [4].

4.2 The Federation of Engineering Institution of Asia and the Pacific, FEIAP

Institution of Engineers Bangladesh (IEB) is a member of FEIAP. FEIAP is an independent umbrella organization for the engineering institutions in the Southeast Asia and the Pacific region, the objectives of which is to encourage the application of technical progress to economic and social advancement throughout the world; to advance engineering as a profession in the interest of all people; and to foster peace throughout the world [4].

4.3 Network of Accreditation Bodies for Engineering Education in Asia, NABEEA

It's full Members: Bangladesh, Chinese Taipei, Japan, Korea, Malaysia, Philippines, Singapore and Thailand [4]. Its major aim also is to ensure quality in engineering education.

5. CONCLUSION AND RECOMMENDATIONS

So, we find that time is ripe enough to ensure quality in engineering education everywhere in this world.

This is necessary because of global competition and globalization of everything. Although the advanced countries are running ahead in this respect, the 3rd world countries also should try their best as the CEOs/Owners of industries try to ensure quality in their products. If it might be difficult and time consuming to get ABET or similar other well recognized organization's accreditation for local Engineering degrees, the authorities can give option to get accreditation from other different accrediting agencies. In this respect Quality Assurance through ISO can be a solution as ISO principles can equally be applied to universities in modified form as most organizations in 3rd world countries are familiar to ISO quality Assurance program. Moreover ISO standards have already been implemented in some educational institutions of higher learning throughout the world.

In our opinion the following can be given proper consideration to improve the present scenario.

1. For the greater interest of the country as well as education and to ensure quality assurance in education, implementation of ISO quality assurance program or any other recognized international accreditation program must be implemented in all local universities soon. This is needed for the future sake of graduates.

2. To oversee the proper implementation of the program, a strong committee may be formed to monitor.

3. Universities not following quality assurance program must not be given permission to continue its educational program.

4. Accredited engineering degrees can be made a major requirement in recruiting fresh engineers in every place and in every country.

6. REFERENCES

- [1] M. Nazih, B. C. Mouafa, and J. Ahamd, "A survey of Engineering Education in developing countries - The Lebanese case", *Wseas Transactions on Advances in Engineering Education*, Issue 11, Volume 6, pp. 430-441, November 2009
- [2] S. Edward, *Total Quality Management in Education*. London: Kogan Page, 2002
- [3] S. Karapetrovic, D. Rajamani, and W. Willborn, "The University 'Manufacturing' System: ISO 9000 and Accreditation Issues" *Int. J. Engng Ed.* Vol. 13, No. 3, pp. 180-189, 1997
- [4] R. Islam "Challenges for Engineers in the New Millennium Washington Accord" *J. Engg. Sc Mgmt. Ed.* Vol-5 Issue-II (452-457), 2012
- [5] M. A. Karim, "Dhaka University Where it will be in 2021" (*personal Communication from the author now Vice President of Research, Old Dominican University, Virginia, USA*), 2011