

# Strengthening University-Industry Linkage in Developing Countries Through International Cooperation: Case of Sri Lanka Through Cooperation of Toyohashi University of Technology, Japan

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*Abstract -The paper aims at highlighting the importance & the role of the University-Industry linkage in fostering the development of engineering education in developing countries. International cooperation is employed as the tool for strengthening this link and the pilot project on the faculty of engineering, University of Moratuwa, Sri Lanka (UoM) through the efforts of the International Cooperation Center for Engineering Education Development (ICCEED) of Toyohashi University of Technology (TUT), Japan is described. The project implementation strategy & current status are presented and the expected output is highlighted.*

## 1. INTRODUCTION

### 1.1 Importance of University-Industry linkage in Engineering Education

In the strategy for promoting the knowledge intensive economic development, engineering education and research plays an utmost important role in order to enable the competitive use of knowledge for innovation and for providing solutions to the challenges of the humankind. It is the excellence in this science/engineering education and research that gives a country a competitive edge over the others with reference to the economic development.

The excellence in engineering education and research is attributed to many factors among which the university-industry linkage has proven to be very important. It is the most effective mechanism where both the university and the industry act as complementary organizations to share resources to achieve a common goal. The linkage would permit the flow of much needed funding to carry out research in universities either sponsored or collaborative nature, put into meaningful use of the knowledge & skills of the academics, possibilities of innovations of value to both university & industry respecting intellectual property rights,

make use of the resulting industry experience back in the teaching programs & postgraduate research and national level contribution for local technology development. The strength of the university-industry linkage will depend on the closeness, mutual understanding of strengths & weaknesses, confidence with reference to either parties and on the effectiveness of the management of the activities in the linkage.

### 1.2 The Role of International Cooperation

Experience has shown that engineering education and research thrive on exchanges across borders of all spheres. In this context, International Cooperation is recognized as an important mechanism that is mutually beneficial to the parties by whom the cooperation is formed of. From the perspective of developing countries, it has proven to be a handy mechanism with reference to engineering education & research, as an effective means of human resource development & institutional capacity building in regionally competitive local technological development. Moreover, the stimulation & synergy resulting from international cooperation can enhance the quality of research undertaken and reduce the financial burden. On the other hand, from the perspective of developed countries, international cooperation has been able to attract talented students who are eager to learn & conduct research under well-developed infrastructure. This enables the developed countries to enhance their quality of education, sustain their research activities, which in most cases threatened by diminishing interests of local students and also to get to know the technological needs in developing countries more precisely thereby opening new avenues for innovation [1]. Finally, on a global perspective, it will enable both developed as well as developing countries to work on a common platform to meet global challenges of economic & social development in a sustainable manner. This is an important element to all developing nations.

## 2 CHALLENGES FACED BY UNIVERSITY-INDUSTRY LINKAGES IN DEVELOPING COUNTRIES

### 2.1 University-Industry Linkage Strategies in Developed Countries

University-industry linkage became an important element in the higher education policy circle even in developed countries only in the latter part of the 20<sup>th</sup> century. This was considered as a means of keeping up leading edge research, transfer & application of knowledge for social development and international competitiveness and had resulted in a drastic increase of commercialization of public research [2]. University-industry linkage facilitating the complementary advantages of working towards a common goal has been the major driving force in earnings of both parties. Provision of venture capital, intellectual property regulations and a national innovation system are specific features related to university-industry linkage in developed countries. Having reached the state of a strong research & development base, the usual measures employed for the promotion of university-industry linkage are structural measures comprised of collaborative research centers, incubators, innovation & science creation centers, science & technology parks, etc.

### 2.2 Challenges Faced by Developing Countries in Employing Models of Developed Countries.

Almost in all developing countries, the technical knowhow of most internationally competitive industries are imported from developed countries. This demands for an immediate term need of being acquainted with this technical knowhow and also the ability to adopt the technology to suit local conditions & practices [3]. Hence, the immediate term university-industry linkage requirement would be to meet these needs. However, in the long-term, developing countries need to establish their own science & technology capabilities in order to be in par with global trends and to be internationally competitive.

In this regard, a major issue in developing countries is a serious lack in their research & development capabilities. If developing countries were to adopt the structural model of university-industry linkage of the developed world, they would have to first address the issue of lack of research & development capabilities during a transition period. In this scenario, international cooperation could play a vital role to enhance the research & development capabilities of the developing world in promoting university-industry linkage. However, for a more effective output, developing countries should focus on areas of their strengths and opportunities in line with government policies.

## 3 INTERNATIONAL COOPERATION CENTER FOR ENGINEERING EDUCATION DEVELOPMENT (ICCEED) OF TOYOHASHI UNIVERSITY OF TECHNOLOGY (TUT)

### 3.1 Philosophy & Structure of ICCEED

The demand for human resources that could sustain the technological advancement, global environment and economy on a global scale is becoming stronger and the ability of developing countries in meeting the bottom line of this demand both in terms of quality & quantity is becoming weaker. The government of Japan implemented the Official Development Assistance (ODA) in extending the frontiers of education through international cooperation as a means of addressing the above issue. In response to this initiative TUT established the ICCEED in 2001.

ICCEED aims to pioneer effective and efficient methods to foster researchers and experts who have potential and competitive power in the field of engineering in developing countries. The ICCEED has two divisions namely division of network & database development and the division of project development. It encompasses five priority areas indicated by research & development evaluation methods, construction of international cooperation network, research & development of engineering education projects, research & development of intellectual & human resource database and research on multilateral network in regional areas. The figure below (Fig. 3.1) indicates the organization structure of ICCEED.

ICCEED is devoted to international cooperation activities to foster skillful and sensible engineers in many developing countries. The Steering Council of the ICCEED is comprised of officials from the Ministry of Education, Culture, Sports, Science & technology, Ministry of Foreign Affairs, Japan International Cooperation Agency (JICA), Japan Bank of International Cooperation (JBIC), Association of National Colleges of Technology and other distinguished experts in order to provide advice on basic policy, activity plans and other relevant matters. In addition the Committee of Research Promotion Unit analyses the action plans decided by the Steering Council.

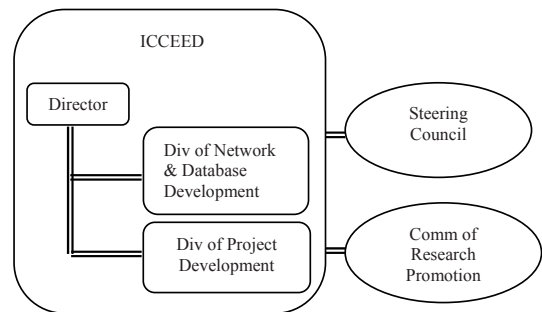


Fig. 3.1 Organization Structure of ICCEED

### 3.2 Highlights of Past & Current Activities of ICCEED [4]

TUT has been vigorously active in international exchange activities since 1990 and as a result ICCEED was established in 2001 with the mandate of being the international arm of TUT. For example, Pathumwan Technical College Project (1993-2000), Thammasat University Expansion Project (1994-2001), Riyadh technical School of Electronics Promotion (1995-1998), Institut Teknologi Bandung Reforms Support Project (1998-2000), Lampung University Support Project (1998-2000), ASEAN University Network/Southeast Asia Engineering Education Development Network Project (AUN/SEED-Net) (2001-2008), Higher Education Development Support Project (HEDS) (1990-2002). As for ICCEED, it has been active in evaluating the HEDS project, AUN/SEED-Net and more recently implementing engineering education development projects in Indonesia, Vietnam & Sri Lanka.

## 4 CASE OF SRI LANKA

### 4.1 Current status of Institutional Mechanism for university-industry linkage

As for engineering education in Sri Lanka, 03 public universities namely University of Moratuwa (UoM), University of Peradeniya (UoP) and University of Ruhuna (UoR) offer 04 year internal degree programs in engineering for an annual intake of about 1100 students while the Open University (OUSL) offers a degree program through distance learning mode, all accredited by the Institution of Engineers Sri Lanka (IESL). Further, several study programs within these degree programs have received international accreditation status. In addition, few engineering degree programs are also offered by institutes and by those, which are private and affiliated to foreign universities. In addition to undergraduate study programs, UoM & UoP also conducts postgraduate programs mainly at Masters level (M.Sc & M.Eng) and M.Phil & Ph.D programs through research. These postgraduate programs are offered in the part-time and in the full-time mode providing opportunities for the candidates from the industry to enroll.

University-industry linkage has received acceptable degree of attention in engineering faculties in the most recent past. The faculties of engineering of UoM and UoP employ several mechanisms, which are similar in nature for the purpose of executing activities related to university-industry linkages. These mechanisms are undergraduate projects with some industry component, consultancy tasks by the faculty members at the request of industry, other outreach activities such as seminars, workshops, testing etc., Engineering Design Center of the faculty of engineering (EDC) and the University Industry Interaction Cell (UIIC) both established under Asian Development Bank (ADB) assistance. In addition, UoM has UNI-Consultancy Service (UNIC), which is the commercial arm of the university registered under company ordinance of

Sri Lanka and UoP has the Center for Engineering Research and Postgraduate Studies (CERPS).

In addition, individual departments have their Department Industry Consultative Boards (DICB) and the faculties as a whole have Faculty Industry Consultative Boards (FICB) to interact with the industry with reference to policy and curricula development matters. Both DICB & FICB are comprised of board members who are carefully selected among distinguished engineering professionals from the local industry. In conclusion, it is observed that the engineering faculties in Sri Lanka, at present, have put in place several mechanisms related to university-industry linkage activities. However, it is also observed that the output of these mechanisms are still far from expected levels due to many challenges and issues faced by the engineering education system.

Among the challenges and issues faced by engineering education, the ones, which are related to university-industry linkages, are of importance. It is noted that universities are more oriented to knowledge & intellectual achievements and do not much exhibit a dynamic culture/environment of innovative research & development, targeting competitive use of knowledge for scientific & technical development. Further, it is noted that the transfer of knowledge through university industry links has not been very impressive compared to those in countries of similar social & economic development needs. In line with expenditure on tertiary education, funding for research & development is found to be relatively low. It is noted that the engineering faculties would have liked to have more patents, increase in number of industry consultancies & related income generated and more postgraduate work linked to addressing industry problems and related publications. Furthermore, the government being the key player in the tertiary education has not been able to be in par with the tertiary education expansion trends in the region.

Strengthening the university-industry link is an important aspect in engineering education in Sri Lanka. It is the most effective mechanism where both the university and the industry could benefit at the same time. The linkage would permit the flow of much needed funding to carry out research in universities either sponsored or collaborative nature, put into meaningful use of the knowledge & skills of the academics, possibilities of innovations of value to both university & industry, make use of the resulting industry experience back in the teaching programs & postgraduate research and national level contribution of local technology development.

In the national perspective, it is observed that many initiations are taking place and efforts are being consolidated among main stakeholders such as relevant Ministries, Science & Engineering universities and Industry Associations with the prime aim of strengthening the University-Industry-

Government linkage related activities in view of developing the local science & technology base.

#### 4.2 Description of Strategy with the ICCEEDs Cooperation

University-industry linkage activities are not only a practice at TUT sponsored by the Ministry of Education, Sports, Culture, Science & Technology (MEXT) program of International Cooperation Initiative in Education but quite common in universities in Japan. Tokai area where TUT is located has a variety of industries dominated by automobile industries and TUT has good experiences of joint research activities with these industries. ICCEED has been engaged in the implementation of international cooperation projects, dispatching experts, accepting trainees and organizing seminars for fostering the development of engineering education.

In this scenario, ICCEED has started a new project, which aims at introducing methods and experience of university-industry linkage in Japan in strengthening university-industry linkages in developing countries. A pilot project targeting the Faculty of Engineering of University of Moratuwa (UoM) in Sri Lanka is being implemented with the hope of extending the success of the model to few other developing countries. The objectives of this project are (1) capacity building of university-industry linkage coordinators, (2) development of a monitoring & evaluation (M & E) mechanism of university-industry linkage including intellectual property aspects (3) development of a sustainable mechanism of generation and management of a research fund.

ICCEED has conducted a preliminary needs assessment survey of industry in Sri Lanka. In line with priorities & policies of the Ministry of Industrial Development and the impact potential, 05 thrust areas for university-industry linkage activities have been identified. These thrust areas are from the Globally linked and Policy linked industries as defined by the Ministry of Industrial Development. They are Textile & Apparel, Ceramics, Tea & Rubber representing Globally linked and Die & Moulding, Electrical & Electronic components representing Policy linked industries. Their value addition potential, use of local resources and contribution to the GDP have also been considered in the selection. Based upon the result of survey, ICCEED will organize seminars in Sri Lanka and Japan for selected participants from UoM. In the seminars in Japan, trainees will have opportunities to visit Japanese firms in order to observe practices of university-industry linkage together with the matters related to intellectual property rights and management of technology. A certain level of capacity mobilization of the trainees is envisaged enabling them to understand the suitability of the models used in Japan as appropriate to Sri Lanka. Finally trainees are expected, with the assistance of Japanese experts, to develop an action plan to achieve the project objectives. Meantime, a detailed survey will be carried out to identify the

specific needs of the each of the thrust areas. During the implementation stage some projects will be selected from thrust areas and will be monitored for performance and evaluate the success of the model to be able to extend to few other developing countries. The Figure below (Fig. 4.1) indicates the organization structure of the pilot project.

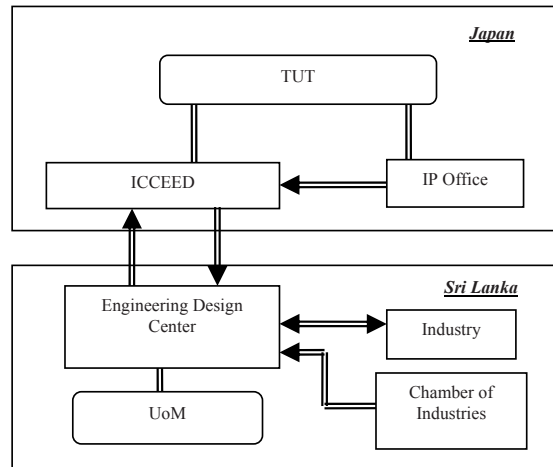


Fig. 4.1 Pilot Project Organization Structure

## 5 REMARKS

Universities in Sri Lanka are more oriented to provide theoretical knowledge & intellectual achievements and provide fewer opportunities for the fresh engineering graduates to develop critical thinking & skills oriented towards technology development. Moreover, the transfer of knowledge through university industry links has not been very impressive compared to those in countries of similar social & economic development needs in terms of standard criteria.

This pilot project aims at strengthening the existing mechanism of university-industry linkage at the UoM through one of the international cooperation activities of ICCEED. From the UoM perspective, the project is looking forward for outputs of capacity building of university-industry linkage coordinators, development of a monitoring & evaluation (M & E) mechanism of university-industry linkage activities and also the development of a sustainable mechanism of generation and management of a research fund. It is also expected to increase the number of patents and industry related research projects resulting from the momentum gained by the project. Finally based on the success of the pilot project

it is expected to extend the model to few other developing countries.

From the perspective of TUT, Institute is interested in offering opportunities to smart students from abroad. It is observed that the international students not only stimulate Japanese students but also contribute to improvement quality and efficiency of research in the university. Out of 2000 students in TUT, there are about 180 international students and these international students contribute to improvement of quality of education at TUT.

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