COLLABORATION MODELS IN TRAINING OF ENGINEERING PERSONNEL: *CASE OF DIT**

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Abstract

The paper gives an overview of collaboration models in training of engineering personnel in Tanzania, case of the Dar es Salaam Institute of Technology (DIT). Main types of collaboration and networks are discussed. A mini survey involving 25 respondents from 17 technical educations and training institutions in 6 African Countries is presented and discussed. The survey collected information on collaboration in training of engineering personnel and was carried out in May 2008. Basing on DIT's experience potential of accelerated engineering human resource development as a result of collaborative activities such as joint research projects and academia-industry partnership is confirmed.

Keywords

Collaboration models, networking, training, engineering personnel,

1.0 INTRODUCTION

While countries have boundaries, knowledge and skills have none. Globalisation, the recent technological changes as well as rapid developments in science and technology have had an influence on the lives of the people world wide. In the developed world, such trends have raised the population to an unprecedented level of prosperity. That, however, is not the case for most of the developing countries especially those in Africa including Tanzania, where the vast majority of the people have hardly benefited from these new developments. Conditions that bring about development show that a country with a critical mass of educated good quality (engineering/technology) labour force stands a better chance to develop because its people are familiar with working mechanism of the market economy and are able to make rational decisions based upon that knowledge. These people, for example, are particularly useful for mass production of homogenized products which is one of the main features of the rapid growth of Asian economy [1].

2.0 TYPES OF COLLABORATION IN TRAINING OF EGINEERING PERSONNEL

Aim of collaborations is to bridge capacity and technological gaps between partners. Collaboration and networking in academia assist partners in terms of sharing knowledge and resources in innovation, research and development activities. Primary areas of collaboration are: i) sharing of resources; ii) exchange of information; iii) transfer of technology; and iv) dissemination of knowledge. Collaborations, especially in engineering human resources development, are realised through physical collaboration and networking between partner institutions.

Recently virtual (web-based) collaborations and networks have emerged as a result of advent of information and communications technology. Based on the characteristics of partners, collaboration types could be categorised into academic collaboration when partners are academic institutions only and academia-industry collaboration when one of more partner is coming from industry.

In order for industries to develop and advance their technologies, it is inevitable that they improve the quality as well as quantity of human resource from the science/engineering side. This can be cost effectively achieved by promoting collaboration between science/engineering institutions and industry. This type of collaboration commonly focuses on effective use of resources and talents available for products/processes development, testing and research.

Collaboration, apart from encouraging entrepreneurial spirit, narrows the gap between theory and practice for both trainees and trainers. Success of collaboration should be based on mutual interest, benefit and respect, that is, ideally, cooperation between equal partners [2]. The future of collaboration depends on two main factors: interest/commitment among the collaborating partners and adequate resources to support it.

3.0 COLLABORATION MODELS – DIT'S CASE

3.1 Policy Perspective

The Tanzania Development Vision 2025 [3] advocates a new, knowledge-driven economy that is built on creativity, know-how, imagination and innovation. Realization of that aspiration to a greater extent depends on the ability to do research and apply research findings. The Vision recognises the need to globalise preferably through means of leapfrogging in lieu of evolutionary. Furthermore, the Technical Education and Training Policy of Tanzania [4] recognises that Technical education and training in Tanzania cannot be implemented successfully if it is not done in co-operation with the local and international community. The policy recognises, among others, the need of Tanzanian Technical Institutions to collaborate with industry, international institutions and development partners on research, training and technology development.

The Dar es Salaam Institute of Technology (DIT) has been selected as study case on exploring collaboration models in training of engineering personnel. DIT was established by the Parliamentary Act No. 6 of 1997 [7] and is accredited by the National Council for Technical Education (NACTE) [8] to provide technician and engineering training at the Ordinary Diploma and Bachelor of Engineering levels mainly in engineering and technology fields.

3.2 Collaborations models

The DIT collaborates with a number of academic/research institutions and a few organisations. Key collaborating partners are Commission for Science and Technology (COSTECH), Leeds Metropolitan University (LeedsMet) of UK, the Royal Institute of Technology (KTH) of Sweden and the College of Engineering and Technology (CoET, UDSM) of Tanzania. Typical collaboration models and the corresponding benefits based on the experience of DIT are discussed below.

a) Solid Waste Management for small and medium enterprises (2002-2005)

DIT and LeedsMet collaborated on a project for building capacity of "*Solid Waste Management for small and medium enterprises.* The project was supported by DFID and the **British Council Dar es Salaam**. The collaboration focussed on capacity building for DIT staff and development of Solid Waste Management (SWM) training materials for small and medium enterprises. The capacity built through this collaboration enabled DIT to win the project for training SWM to six Municipalities in Tanzania under the International Labour Organisation as Client. Within the scope of the project, 181 members form Community Based Organisations (CBOs) and Community Based Enterprises (CBEs) providing solid waste management services and 51 health officers from 6 municipalities in Tanzania were trained. The collaboration contributed to improved management of CBOs/CBEs and in some cases has led to the: improvement of efficiency; improved profit generation; and sustainability of the trained CBOs/CBEs.

This collaboration model is based on Training of Trainers (TOT) linked to transfer of knowledge to the industry. Experience gained is used in enriching curriculum and teaching at DIT.

b) NACTE, LeedsMet and DIT Collaboration (July 2006 – June 2007)

The NACTE, DIT and LeedsMet collaborated in Training a Task Force which will act as an agent to develop the quality, standards and capacity of Tanzanian Tertiary Technical Institutions through the England Africa Partnership Project (EAP 24). All non –university tertiary institutions in Tanzania are required by law to register and run NACTE accredited programmes. NACTE has developed regulations and procedures for exercising its mandate. Most of the 205 technical institutions in Tanzania were expected to comply to the NACTE's regulations and procedures and were achieving some success in regenerating their curricula for validation, but a large proportion (approx 90%) of the 205 technical institutions in total were observed to be experiencing some significant difficulties in attempting to comply with the quality and standards requirements of NACTE.

Resources available at NACTE were insufficient for training and supporting the 205 institutions under NACTE's mandate. NACTE, DIT and LeedsMet created and trained a Tertiary Task Force (TTF) comprised of 18 academic staff from 14 institutions to act as an agent of change in the training and up-skilling of their peers across the sector and to enable their institutions to comply more effectively with the requirements of NACTE. T*he task force created* a set of short courses and related materials for the effective delivery of programmes of institutional development for tertiary technical institutions.

The subject model of collaboration is suitable for fast track capacity building in collaboration with stakeholders by training a team of experts selected from target institutions and using them to disseminate knowledge gained in either consultative or peer to peer ways.

c) COSTECH, KTH (Sweden) and DIT Collaboration (2006-2009)

The Commission for Science and Technology (COSTECH), DIT and the Royal Institute of Technology (KTH) are collaborating in the *ICT for Rural Development (ICT4RD) Project which is a Research and Development (R&D) Project funded* by Swedish International Development Agency (SIDA). ICT4RD Project aims at designing and validating a strategy for establishing sustainable, low cost connectivity in rural Tanzania by effectively using unutilized ICT capacity and infrastructures as a way of implementing the national ICT policy. ICT4RD advocates the "Open Access" concept which encourages sharing of infrastructure resources to provide connectivity.

In this tripartite collaboration, COSTECH provides the R&D component while DIT and KTH are providing training and capacity building components. As a part of implementation of the project, experience has been gained by working with multi-stakeholders, namely Tanzania Electricity Supply Company Ltd (TANESCO), Ministry of Water, the Tanzania Communication Regulatory Authority (TCRA) and a Non Governmental Organisation (NGO) by the name of Juasun.net. Some of the outputs of the project include: Connecting fifteen (15) and eighteen (18) villages in Mara Regions respectively. Further, two (2) and one (1) Tanzanians are being trained to the levels of masters and PhD respectively.

In this model collaboration, capacity is built through training and implementing real life projects that have been identified based on the demand of the respective community. Experience gained is rich in theory and practical but it takes long time to achieve the outcomes.

d) In country collaboration

DIT is also collaborating with he College of Engineering and Technology (CoET) of the University of Dar es salaam (UDSM), Technical College Arusha (TCA), Karume Technical College (KTC) and the Mbeya Institute of Science and Technology (MIST). Main areas of collaboration are external examinations, research and conferences/workshops organisation. Collaboration with Tanzania Roads Authority (TANROADS) is recently developing in traffic light design, fabrication and installation.

4.0 SCALE AND CHARACTERISTIC OF COLLABORATION IN TRAINING OF ENGINEERING PERSONNEL IN AFRICA

A mini survey to collect information on collaboration in tertiary institutions in Africa was carried out in May 2008 purposely to establish the scale of characteristic of collaboration and to validate experience of DIT gained in various collaborations. A structured questionnaire was administered to delegates who were attending the CAPA Kampala Conference organised by the Commonwealth Association of Polytechnics in Africa (CAPA) in Equatorial Hotel, Kampala, Uganda – May 19th – 23rd, 2008. These delegates mainly comprised of Institutional Heads (Principals/Rectors/Vice Chancellors) and Senior Management Staff (Deputy Principals/Rectors/Registrars, etc.) from eleven (11) African countries. Out of 47 delegates targeted 25 delegates responded. The responses (respondents) came from 17 technical education and training institutions in 6 African countries, namely, Kenya, Ghana, Nigeria, Tanzania, Uganda and Zambia.

Analysis of the respondent's feedback showed that between 1990 – 2000 only 8.3% of respondents had more than 5 academic collaborations and whereas between 2001 – 2008 numbers of respondents with more than 5 academic collaborations increased to 37.5%, see figure 4.1. Analysis of the scale of academia-industry collaboration between 1990-2000 and 2001 – 2008, showed that the number of respondents with more than 5 academia-industry collaborations increased from 50% to 72.5%, see figure 4.2.

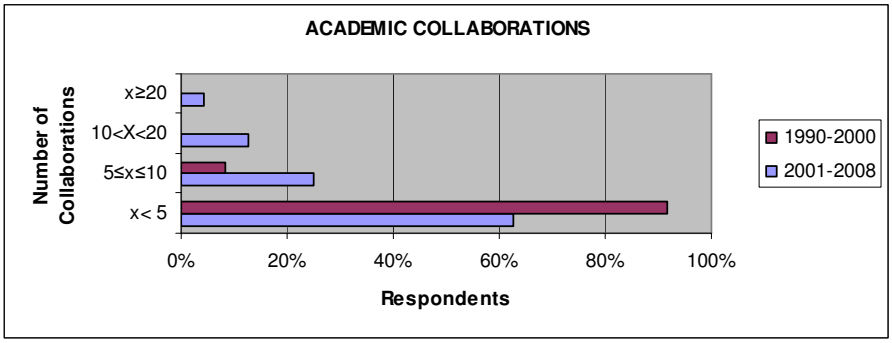

Figure 4.1 Academic collaboration scale

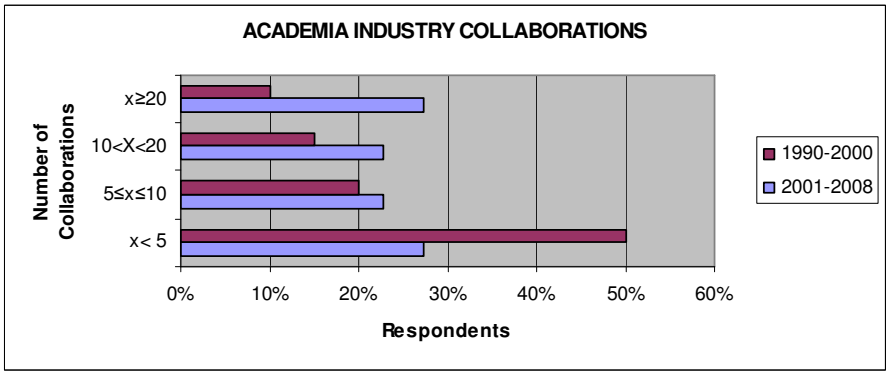

Figure 4.2 Academia-industry collaboration scale

Regarding benefits of collaboration, 68% of the respondents strongly agreed that local partnerships in Africa would help to identify problems in Africa and provide opportunities for research and technology development, see Figure 4.3. At the same time 62.5% of them strongly agreed that solutions emanating from such research and development would address African problems more directly, see Figure 4.4. With regard to ICT, 76% of the respondents strongly agreed that the growth of ICT services would enable institutions in Africa to engage in and benefit from globalised research and technology development projects, see Figure 4.5. Analysis of the critical benefits of partnership and collaboration show that 64% of the respondents strongly agreed that collaboration leads to the optimal use of human resources, see Figure 4.6.

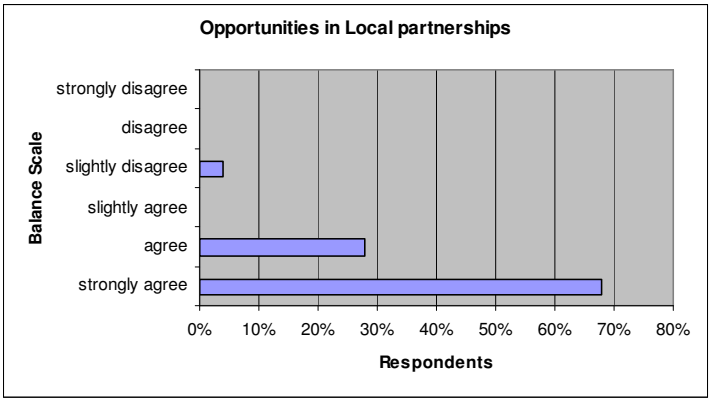

Figure 4.3 Collaboration for problems solving in Africa

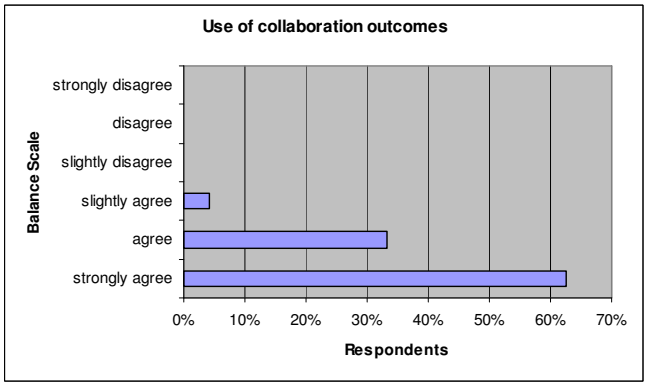

Figure 4.4 Local collaborative for addressing African problems

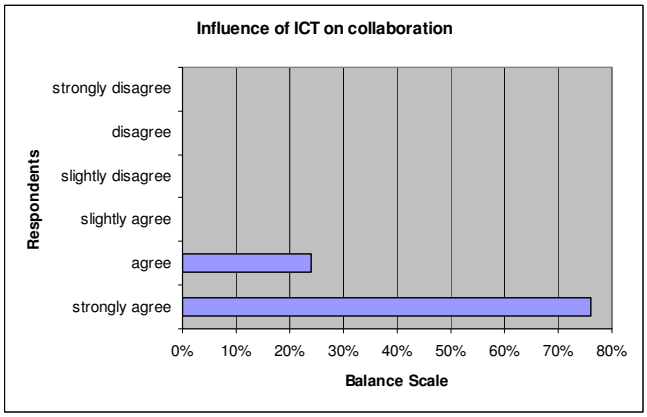

Figure 4.5 Impact of the growth of ICT services in Africa

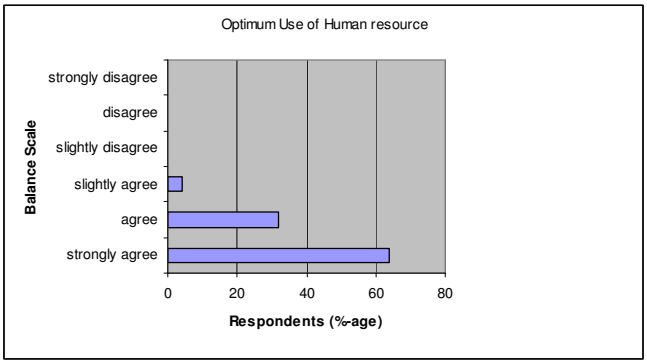

Figure 4.6 Use of Human Resources

5.0 COLLABORATIONS CHALLENGES AND LESSONS

A number of challenges and lessons have emerged from the experiences of DIT with its partners in the execution of collaborative projects and some have been confirmed vide questionnaire referred above. Lessons gained from these collaborations were as follows:

a) it would seem important to establish partnerships and collaboration within Tanzania and in Africa in order to identify problems which could be turned to opportunities for Research and Technological Development (R&D) in Tanzania and Africa in general.
b) solutions emanating from outcomes of such R&D would be better owned by Tanzania and would address problems of Tanzania directly
c) critical benefits of partnerships and collaboration include the optimal use of facilities and of human resources.
d) the advent and growth of ICT services in Tanzania/Africa will enable institutions/industries to have better capacity to participate and benefit from their participation in globalised Research and Technological Development initiatives

Challenges experienced in executing the collaborations and confirmed by the questionnaire are as follows.

a) links pursued were mostly of international type that is North-South and it suggests a low level of collaboration and partnerships of South-South type or internal/local ones.
b) experience gained reveals that benefits of partnerships and collaboration for DIT were mainly in staff capacity building whereas our partners (from North) were exploring opportunities for Research and Technological Development (R&D).
c) In Tanzania, collaboration between Industry and Academic Institutions is weak and therefore hinders dissemination and application of knowledge generated in institutions of engineering/technology.

6.0 CONCLUSION

Industries must be encouraged to work closely together and with Academic institutions based on needs. This is a two-way traffic of either bridging each ones gaps or joining forces to make impact. Information and facts emanating from DIT experience are not adequate in drawing global conclusion. It is therefore deemed necessary to carry out further situation analysis through a survey of industry and other similar institutions. Outcome will enable authors to confirm more widely the major challenges and to suggest solutions of value to collaborations in training of engineering human resource.

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