

## **Making University Curriculum Development Friendly to Industry: Towards a TVET Agenda**

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### **Abstract**

*In recent years, there has been a rapid technological change in the world in many fields. From time to time, there are ever widening technical skill gaps in the labour market of scientists and an engineering technician. This paper explores the diffusion and characteristics of collaborative relationships between universities and industry in the implementation of TVET Curriculum. It builds on the experience of six- year study of transformation efforts of the technical education development of Mbeya University of Science and Technology (MUST). In our professionals and technologists experience, education teaching practices and interrogation with the industry firms are necessary elements of the university curriculum development, leading to high quality results when effectively implemented. The paper builds on the critical examination of the current status of curriculum and how it is linked with industry in teaching and learning at MUST. The enabling and constraining factors affecting its operation and development in the light of the serious bottlenecks were identified, analysed, and recommended upon. The analysis was performed on the basis of the existing body of research, the role of practices such as collaborative research, and the university curriculum relations to industry research centres. Furthermore, the paper explores the strategies used to combat these challenges and suggests the way forward.*

**Keywords:** Curriculum, education, ICT, industry, IPT/FPT, Tanzania, TVET

### **Introduction**

This study seeks to explore the phenomenon of the diffusion and characteristics of collaborative relationships between universities and the implementation of TVET Curriculum. The universities worldwide seek to understand the potential future interaction between human and technology due to the need for radical change and innovation required to meet the environmental challenges that are emerging in our modern society. For this reason, it has become evident that action is required to develop the curriculum which will redirect the university towards a friendly environment and practical skills offered to the industry.

Scholastica & Kayange, (2014) argue that Tanzania cannot afford to overlook the significance of information and communication technology (ICT) for enhancing the execution of the university- curriculum. In the interconnected world, knowledge and information are becoming cornerstones in the development of a society, as it is the ability to communicate. Having this in mind, there is an advantage of the full range of ICTs, from radio and mobile telephony to

computers and the internet, in building the foundation for a well-educated and learning society.

The MUST curriculum has helped to develop a direction for the university and the TVET society. Its capacity and predisposition contribute effectively to impacting the society and technology endeavours which propels it towards becoming a leading University of Science and Technology and ensures that it becomes a centre of excellence for academics, research and consultancy. It needs therefore to build strong foundations for future national prosperity, helping to make TVET community productive and internationally competitive in the global economy.

As a result there are increased pressures on industrial sector to continually advance knowledge and new technologies in order to ensure sustained prosperity and survival (Ali, 1994). In this regard, the past practices has favoured internal initiatives. However, it is increasingly more difficult for firms to rely exclusively on in-house activities due to limited expertise and resources (Hamel & Prahalad, 2013 & Kayange, 2015).

Thus, industry can acquire knowledge and technology from various external sources. These sources include competing industries, research centres, government laboratories, industry research associations, and universities. Universities play a big role in terms of recruiting graduates and faculty to serve as employees and consultants.

According to Okubo & Sjöberg (2000), they report that much of the inter-organizational literature focuses on the collaboration between two or more industrial firms. The concentration is on the industry and the university relations in curriculum development and implementation. The collaboration in curriculum development between the industry and university is inevitable, alliances which represent an evolving trend for advancing knowledge and new technologies.

## **Problem Statement**

In spite of the various collaboration to ensure that university curriculum are well equipped with the mandatory practical skills for the job market, it has not attracted much to industries. Amongst the reasons for this is that most industries are more interested in the industry development and production than in curriculum business. Thus, the university curriculum have not been influenced by industry in their respective fields of training resulting from poor collaboration.

## **Objectives of the Study**

The objective of the research was to develop a model curriculum that would encourage collaboration research based agenda for TVET.

## **Industrial Practical Training (IPTR) Support**

The university curriculum relationship with industry, as modeled by the Mbeya University of Science and Technology which is located in the Mbeya City in the

Southern Highlands of Tanzania. It has potential areas surrounded by various industries such as Tanzania Breweries Ltd, Coca Cola, Pepsi, City coffee, Mbeya Cement Company Ltd, and Mbeya textile. In this regard, the students' Industrial/Field Practical Training (IPT/FPT) is recognized in the curriculum of the university as a course module and is conducted often after completing the class modules. The IPT/FPT module is designed to enable MUST graduates to become competent and able to meet challenges of the job market and also to make them think positively towards self-employment and entrepreneurship. MUST should learn to automatically extrapolate these motions in the curriculum in the Industrial/Field Practical Training (IPT/FPT) when attached to the industry for practical sessions. In most cases, the important feature of TVET that is fulfilled is its orientation towards the world of work. Therefore, a TVET curriculum implementation is necessary to achieve better results in the acquisition of employable skills.

Since there is a growing demand for skilled workers, training in Industrial/Field Practical Training (IPT/FPT) should make it easy to access better jobs. With the skill building programs, more students will be able to access valuable hands-on learning opportunities and get ready to make the transition to industry practical training. Bringing more TVET programmes into our classrooms in rural communities will allow students to learn and contribute to their local community and economy.

#### **MUST – Industry Relation Research (MUST-IRR)**

The Research and Publications Department is responsible for overall coordination and administration of Research and Publication activities. For this reason, there is a mutual relationship which is more interactive than Industrial/Field Practical Training (IPT/FPT) support, and this includes contract research with individual investigators, consultation by MUST Consultancy Bureau (MCB), and certain group arrangements specifically for addressing immediate industry problems. In addition, the department performs the following activities: Coordinates projects for both students and staff, plans and coordinates curriculum activities; organizes and produces posters/leaflets, newsletters and other information documents; arranges for academic workshops, acts as the custodian of research and consultancy reports, and disseminates findings for academic purpose and other uses. These endeavours, which have to do with the curriculum implementation destined for TVET, are based merely on students practical, and the university relationship with the industry. Thus, advancing new technologies has not traditionally been one of the major motivations for the industry– university relation as industrial firms often seek other industrial firms rather than work with a university.

#### **Methodology**

This paper builds on a six -year longitudinal collaborative research study of the development of the curriculum of the university parallel with the transformation process at Mbeya University of Science and Technology (MUST). This paper

provides four various sources of data: participation observation, person and email interviews with three of the main actors within MUST; archives related to the communications forum at MUST; and finally, prior Research and Publications Department featuring analysis of MUST agenda, processes, and outcomes.

Participant observation is the process enabling researchers to learn about the activities of the people under study in the natural settings. This has been used in a variety of disciplines as a tool for collecting information about people and cultures. The paper of (Marshall & Rossman, 2014) define observation as “the systematic description of events, behaviours, and artifacts in the social setting chosen for study. Observation helps the researcher to describe the existing system using the five senses, and providing a “written photograph” of the situation under study (Erlandson, 1993). The report by De Munck and Sobo (1998), describes participant observation as the primary method used by anthropologists doing fieldwork. Fieldwork involves “active looking, informal interviewing, writing detailed field notes, and perhaps most importantly, patience”. In DeWalt & DeWalt (2010), they provide the context for development of sampling guidelines and interview guides. The authors Schensul, Schensul, & LeCompte, (1999) define participant observation as “the process of learning through exposure to or involvement in the day-to-day activities of participants in the researcher setting”. Our approach extends these efforts by describing our experiences of curriculum development for the Department of Electronics and Telecommunication Engineering and presents reflections and participation observation on knowledge accumulated on a curriculum development process.

The Electronics and Telecommunication Engineering curriculum should purpose to provide students with an understanding of the past that has shaped the society and culture in which they grow up and develop, and with knowledge, understanding and skills that will help them in their future lives. In this regard, the data was sought from friends, private sectors, industries and across a number of universities to collect advice and guidance. The Electronics and Telecommunication Engineering curriculum make clear to teachers what has to be taught; and to students what they should learn and what achievement standards are expected of them in each stage of NTA level 4, 5 and 6.

### **The Internal and External Research Roles in Clinical Inquiry**

In writing about the university-industry curriculum development approach to university research, the notion of the clinical inquiry approach is introduced to this study as a form of action research. What is meant by clinical inquiry? For the purposes of this paper, it means helping professionals who get involved with individuals, groups, communities, or organisations in a helping role. This would include those activities contributing to the university-industry curriculum development for sustaining their transformation and endeavour to lead in science and technology. For example, why nursing clinical inquiry is vital and valued among the health care team? The role of a nurse is to assist the individual, sick or well, in the performance of those activities contributing to the recovery of health.

In the very same way, the principle had been adopted to help individual or groups to identify the importance of the curriculum development with relation to industrial firms.

Clinical inquiry: is the process of interaction with the clients in that it attempts to get the clients' their story out in their own way and to think about the reasons and causal linkages.

The various inquiry interventions produce insights on the part of both the forum members and the researchers. This closely follows the distinguishing features of internal and external research, in that members of the research team differ in physical and psychological connectedness to the university – industry curriculum development setting; and the questions being examined in this epistle, the clinical inquiries, base on the internal and external research.

### **Internal Research Roles in Clinical Inquiry**

#### *Part One: Interviews (University)*

**Table 1: Ratings on the Relationships between Universities and Industry**

Types	Respondent (%)	Curriculum is useful (3 out of 4)	Relationships between University and Industry (2 out of 4)	Curriculum Interrogate with Industry (1 out of 4)	Curriculum is not useful (0 out of 4)
Academic Staff	84	84	56	28	0
Academic Staff	56	56	37	18	0

All respondents indicated that they found the curriculum is useful for all, between the university and industry relationships. The collaboration between the university curricula and the industries has always been an important but complex topic. Now there have been a rapid evolutionary change of the business environment and the vast transformations throughout the academic realm, the subject is now even “hotter” than it was before. Despite that fact, the university can be a major resource in an industry's innovation strategy and guidance for the direction of technology development. What matters it not the outcome, but the impact and how the new knowledge derived from a collaboration with a university can contribute to a company's or industry's performance. Thus, the transformation is vital to the university curriculum since the technology is changing fast. The old ways of doing things no longer work even when it is done in the best way possible.

## Part Two: Interviews (Students)

**Table 2: Ratings on the Relationships between Universities and Industry**

Types	Respondent (%)	Curriculum is useful (3 out of 4)	Relationships between University and Industry (2 out of 4)	Curriculum Interrogate with Industry (1 out of 4)	Curriculum is not useful (0 out of 4)
Degrees of Engineering	70	32	53	17	0
Degrees of Business Administration	14	11	7	4	0
Diploma of Engineering	84	63	42	21	0

Secondly, from the sampled student group agreed that the curriculum is very useful in: Increasing of learning or schooling facilities, enhancing the capacity of the collaboration with the industries, involving non government organization, increasing of the number of facilitators or educators and improvement of learning or teaching Programs.

Further, regarding the relationships between university and industry its involvement with non government organizations (NGOs), it has been observed that there is an increase of NGOs involved in supporting and even investing in tertiary education curriculum, either by providing education sponsorship to some people in the region, or by establishing tertiary public education universities to enable a large number of people to join various faculties. The company/industry always benefits the university in: giving the faculty various sponsorships - for example, provision of learning materials, practical equipments, chemicals, books among others. Also, the companies assist students to enables the students to experience the practical training program to put their theoretical knowledge into real practice.

From the sampled student group, the this study concludes that the curriculum and the transformation of the university has a positive impact on the government, society, as well as in the entire world. It has led to an increase of various learning faculties, and hence many people opt to join various programs or courses in the university.

## External Research Roles in Clinical Inquiry:

### *Part Three: Interviews in Industries*

**Table 3: Ratings on the Relationships between Universities and Industry**

Types	Respondent(%)	Curriculum is Useful(3 out of 4)	Relationships between University and Industry (2 out of 4)	Curriculum Interrogate with Industry (1 out of 4)
Coca Cola	40	30	20	10
Atlas Copco Tanza Ltd	24	18	12	6
Pepsi	45	33	22	11
TBL	28	21	14	7

Thirdly, from the sampled industry group, all respondents indicated that they found the curriculum useful for preparing the learners with industry knowledge, entrepreneurial mindsets and business skills. The University curriculum has developed the capability and built more industry link to improve graduate employability. For example, TBL in southern zone of the United Republic of Tanzania, Mbeya region, students from MUST visit the company two to three times per week for practical learning.

## Discussion

Several methods had been adopted in the six year longitudinal collaborative research study of the curriculum and transformation process at Mbeya University of Science and Technology (MUST). The author Kayange, (2015) reports on the Strategic Fitness Profiling (SFP) during the process of the transformation of the university. The key components of Strategic Fitness Profiling (SFP) approach to research and development include: designing and implementing the platform for curriculum development, the agile nature of learning mechanisms and leading curriculum through learning mechanisms. In order to align with the key components there is a clear schedule of the training staff, to the reputable university and the industrial practical training to the students.

**Intervention Research (IR)** does not impose any methods, but requires involving any relevant actor who is knowledgeable about or involved in creativity and its formalization into models, tools and procedures and where all actors are granted equal access to research and are consistent with the epistemology of IR. The study progressed accordingly. First, a research team was identified to be involved in the university curriculum and transformation. The combined expertise of these actors covered the entire creative process and represented the specific interests that needed to be accommodated. The need for a continuous involvement in the research process limited number the of employees that could be allocated in the team.

In the very same way, most respondents indicated that the present level of the university curriculum is based on basic technology research, while most of the industry laboratories have led to the virtual disappearance of the interdisciplinary, pure, and applied research. The industrial laboratories are interested in the industrial development (system prototype or system demonstration in an operation environment).

In general terms, the research combined different qualitative (mail interviews, Facebook interviews, observations) and quantitative (an exploratory survey) techniques which were all instrumental for a common purpose; that is to understand the social interactions, contextual conditions and individual involvement that characterizes creativity processes. These data were processed by the research team during the roundtable meetings in order to develop models of collective actions.

## **Conclusions**

The need arose in various domains for six-year curriculum development and transformation effort of MUST and provided the empirical case for this paper. The paper captured the complex curriculum and transformation process, mechanisms, activities, and outcomes. The consistency of the SFP orientation coupled with the purpose and execution of learning mechanisms provided the engine for the transformation effort. The article contributes by providing rich data on university practice related to the curriculum development and transformation of the university capabilities. Moreover, developing agility by engaging people at all levels in continuous learning about what needs to change and decentralize how this should be solved might be the path to follow.

## **Recommendations for Further Research**

The research work in this paper focuses on university– curriculum relations with industry research. The qualitative and quantitative techniques demonstrated the superior performance of the proposed university–curriculum relations with industry scheme. There still remain some open issues to be investigated in the future as an extension of this research.

By this analysis method, in the face of these challenges of the Technology Readiness Levels (TRL), many researches at MUST are in the form of basic research and applied research which are in TRL 1 Basic principles observed and reported, TRL

2 Technology concept and/or application formulated, and TRL 3 Analytical and experimental critical function and/or characteristic proof-of concept and these are not interested in the industry. While at the university it is impossible to ignore the basic research and the applied research. It is so in order to spread the university curriculum research relating to the industry. Most of the industries are interested in the Technology Readiness Levels (TRL) from 4 to 9, therefore it is desirable for future research to break this gap.



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