UNIVERSITY - INDUSTRY LINKAGE IN TANZANIA AND ITS IMPACT ON SMES' DEVELOPMENT

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ABSTRACT

The objective of this study was to identify the level of interaction between Tanzanian universities and industry and to analyze the effectiveness of university-industry linkage in contributing to the development of industry and particularly of SMEs in Tanzania. The study was carried out in 2007 to investigate the relationship between universities and industry using the University of Dar es Salaam and Sokoine University of Agriculture as cases, and using a sample of thirty five businesses in Tanzania located in Dar es Salaam. Officials of government ministries and agencies were interviewed and policy documents were reviewed to determine the influence of policies on university-industry linkage in Tanzania. The findings suggest that there was a thin linkage between Tanzanian universities and industry, particularly SMEs. Although several government and university policies were found to be in place promoting linkages between businesses and institutions of higher learning, whatever linkages were found to be in existence did not have strong footing and they did not have a strong on a strong impact on SMEs' development.

BACKGROUND

There is abundant evidence showing that many benefits to an economy arise from a good relationship between universities and industry. The success of many businesses at national and international level has come about through collaboration with and linkages between universities and industry. Governments of developed economies have invested substantially in building infrastructure in order to foster strong university-industry linkages (UIL), which plays a pivotal role in both economic and social development and is key to growth and competitiveness. Likewise, high ranking

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universities in the world have been found to have very strong and sustainable linkages with industry.

The UIL has been the subject of a lot of research. In their endeavours to innovate, businesses have increased their dependence on science and technology, so as to be able to cope with increasing pressure from worldwide competition. To be successful businesses are becoming more and more dependent on their ability to develop new technologies, including tools, and new production methods and processes. Universities are expected to be the main providers of new technology and innovative systems. They provide the knowledge, know-how and the skilled labour force that is vital for industry innovation, which results in lower production costs, better products and better processes.

There are basic differences between universities and industry in terms of structure, time horizons and goals. The structure of universities tends to be based on disciplines, and universities have a long-term horizon with their goal being mainly to create and disseminate knowledge. Industry however, is more structured, geared to solving problems, is under pressure to produce quick results and is driven by the need to maximise profits. Despite the above basic differences between industry and universities, linking them is of the utmost importance.

The benefits of linkages between industry and universities have been experienced in many economies, as these linkages have been associated with economic development and playing a pivotal role in countries' competitiveness. In developing countries/economies these linkages are emerging, albeit at a slow pace, and there is a lot of room for improvement. For example, Mersha (2006) points out that "most African countries inherited a skewed education system which was only aimed at producing technocrats and bureaucrats to serve the administrative set-up of the colonial governments. The education system thus never incorporated the practical orientation needed to make scientists and engineers relevant to the needs of the indigenous agricultural and industrial sectors"[1]. It is also argued that because after independence most African countries adopted an import-substitution industrialisation strategy, which necessitated importing machinery, equipment high-level management and technical personnel, which in turn denied local entrepreneurs opportunity to look for local inputs. Subsequently, there has been no drive to build capacity to produce experts. Indeed in many developing economies, particularly of African countries, the relationship between universities and industry has not been strong. Scientific and academic institutions have few connections with industry. Whereas academics have tended to concentrate on sophisticated research and knowledge development, there has been no evidence of systematic mechanisms through which such knowledge and research findings filters

down to the practical world. Likewise, industry tends to view academics as being too theoretical, living in ivory towers and far from reality. Therefore, there exists the need for the collaboration of universities and industry for their mutual benefit.

In most developing economies not many industries use high-level technology. They are characterised by micro, small and medium industries, most of which are great innovative potential but are not very well nurtured or the subject of research. The innovative capacity of industry in developing economies is likely to be stimulated by the universities creating a technologically supportive environment for business growth. The sharing of knowledge between universities and industry, the marriage between industry and academia, and the link between the formulation of ideas and the application of practical skills will potentially lead to innovation, competitiveness, employment and economic development.

Where the linkage between firms and universities has been fostered, firms have tended to use universities for solving their practical problems and in turn they have supported fundamental research. In such circumstances universities have been very close to industry, are have conducted high-quality and relevant research, which has enabled local industry to compete effectively in the global market. This symbiotic relationship is ideal because it creates synergistic opportunities for both industry and universities. For businesses to compete effectively in the global market and for universities to be relevant, linkage between the two is even more desirable as world trade becomes even more sophisticated.

African economies are entangled in a myriad of social, political and economic problems, solutions to which universities have the potential to contribute to if they were appropriately linked to the respective industries. Despite the linkage between universities and industry being a good thing, the situation obtaining in Africa and indeed in Tanzania is not clearly known, which the justification for this work was. The study focussed on the gap between universities and industry in Tanzania, with particular emphasis on the small and medium enterprises (SMEs), which dominate the economy.

OBJECTIVES AND SCOPE OF THE STUDY

The study was carried out in 2007 to identify the level of interaction between Tanzanian universities and industry and to analyze the effectiveness of those linkages in contributing to the development and competitiveness of industry in Tanzania. The study set out to determine how the various relationships (formal and informal) between Tanzanian firms and universities had been promoted by the policies of government, universities and of businesses.

LITERATURE REVIEW

National Higher Education Policy (1999)

The National Higher Education Policy (NHEP) of the Ministry of Science, Technology and Higher Education (MSTHE) (February 1999) was found to be silent on UIL. It provided the general policy framework for higher education in Tanzania. The objective of the policy was to guide the provision of higher education with respect to the delineation of missions, levels of institutions, curricular orientations and concentration, financing, governance, coordination and linkage with the external world of international education.

According to NHEP, the curricular emphasis of higher education should be on programmes geared towards responding to the changing world of science and technology and the corresponding ever-changing needs of the people, their government, industry, commerce and the environment in general. The statement in the document, which is close to being relevant to UIL states that researchers, scientists and technologists within the country should be encouraged through incentive schemes to enable them to make a scientific contribution to society. The policy document concludes by calling on the government to encourage and promote institutional linkages as well as encouraging collaboration between local and foreign academic institutions.

Analysis of the NHEP document showed that the need for UIL was not explicit but implied. The document lacked a strategy as to how the implied linkages would take place.

National Science and Technology Policy (NSTP) of Tanzania (April 1996)

The objective of the NSTP is to reflect the key role that science and technology should play in bringing about rapid socio-economic development in Tanzania. The policy realises that an implicit relationship exists between the development process and the application of scientific knowledge, techniques and organisational methods in the production of goods and services. The policy's is to regulate the flow of technology so as to reduce excess dependence on imported technologies. The policy guides government ministries and parastatal organisations, including universities, other research and training institutions and non-governmental organisations, in the choice, assessment, transfer and adaptation of technologies.

According to the document, the application of science and technology for economic development should, amongst other things, solve problems in key economic, productive and social welfare sectors, such as industry, agriculture, energy and health. The policy states that successful application of science and technology entails establishing an effective institutional framework and linkages, so that various science and technology institutions and productive sectors work in a system that is focused on achieving development goals, without undue duplication and competition.

Implementation of the policy at university level is looked at in terms of universities producing scientists, engineers, teachers and technologists, who are well grounded in theory and practice. Apart from mentioning that universities should lead the way in advancing the frontiers of knowledge through basic and applied research, the policy is however silent on how universities would create linkages with industry. The Commission for Science and Technology (COSTECH) is mentioned in the policy as the coordinating body that would harmonise effective transfer of technology in the country. However no clear institutional framework is suggested through which universities would clearly establish a link with industry. Finally, the policy mentions that institutional cooperation within the country would be promoted and supported, and the role of COSTECH in promoting this cooperation would be strengthened.

Sustainable Industrial Development Policy (SIDP) 1996 – 2020 (October 1996)

This policy articulates the framework for the country's industrial development with short, medium and long-term perspectives. The policy stated amongst other things that the success of the industrial sector would in future depend largely upon the degree to which the country developed, consolidated and strengthened basic scientific research, technology and research and development activities. The policy recognises that there was a very weak link between the few Research and Development (R&D) institutions and the productive sector in the country. According to the policy, the reasons for the weak link include industrialists not appreciating the role of R&D activities while research and development institutions do not address the actual needs of the productive sector. Measures recommended to redress this situation include the development of a master-plan to consolidate existing scientific institutions by providing them with adequate finance, expertise, infrastructural facilities and schemes for the retention of technical expertise. Other measures mentioned include effective rationalization and synchronization of R&D institutions, as well as articulating the areas and mechanisms for collaboration between manufacturers and the local R&D network, particularly regarding the financing and management of R&D institutions.

Indeed this policy is articulate on how R&D institutions – including universities - should link up with industry. What is lacking in the document is an implementation strategy for the proposed linkage.

Small and Medium Enterprise Development Policy (SMEDP) (April 2003)

The SMEDP was promulgated to complement the existing economic reforms in various sectors of the economy. The policy focuses on three main areas for SMEs, i.e. the creation of an enabling business environment, developing financial and non-financial services and putting in place a supportive institutional infrastructure. In recognition of the limited access to technology SMEs had, the policy states that: "the government will facilitate the acquisition and adaptation of technologies as well as enhance networking between R&D institutions and SMEs in a bid to upgrade technologies so as to raise the productivity and competitiveness of the sector". One of the strategies for attaining this objective is the establishment of incubators. Like the SIDP policy this policy impliedly recognises and states clearly the importance of UIL.

National Trade Policy (NTP) (February 2003*)*

The objective of the NTP is to steer the country towards competitive export-led growth to realise the goal of poverty eradication. The policy is silent on UIL. The only mention of it is in reference to human skills development.

UNIVERSITY POLICIES

University of Dar es Salaam Corporate Strategic Plan

The University of Dar es Salaam (UDSM) mission is "the unrelenting pursuit of scholarly and strategic research, education, training and public services directed at attainment of equitable and sustainable socio-economic development of Tanzania and the rest of Africa". The UDSM strategic corporate plan had ten strategic objectives and strategic objective number six is "*...to enhance linkages with productive sectors and the society, support for government reforms and poverty reduction efforts*".

The UDSM Corporate Strategic Plan (CSP) was formulated in the light of government policies, including Vision 2025; Poverty Reduction Strategy; Higher Education Policy; Science and Technology Policy; Civil Service and Local Government reforms; National ICT policy, etc.

According to the UDSM CSP the key challenges to be addressed by the UDSM with respect to UIL include:

- Enhancing linkages between UDSM and the private sector including private Universities;
- Quality assurance of output; and
- Improved and relevant research capacity in relation to national needs and development.

It is emphasized by the UDSM CSP that the public and private sector wanted universities to show the relevance, of their products and commitment to cooperating in the development of the society. The aim of the University is to ensure that its teaching, research and public service programmes make substantial impact. It is emphatically stated in the CSP that UDSM would be more socially relevant through a more proactive engagement with the government, economic sectors and society.

The University Consultancy Bureau (UCB) at the UDSM

The UCB is the unit that coordinates consultancy activities at the UDSM. The Bureau facilitates faculties and institutes to carry out one of the missions of the UDSM, which is providing of consultancy/community services. The UCB enhances society's appreciation of the relevance (role and contribution) of the university in solving socio-economic and scientific problems through soliciting consultancies.

The UCB's "Operational Policy and Procedures" is well documented[2]. The document provides guidelines on operational procedures but does not articulate clearly the role of the UDSM in terms of UIL. A few sections that sound relevant to the UIL are 4.1 and 4.2.2, which state that the UDSM encourages academic staff to seek and participate in sponsored research, to consult widely and to engage in other activities which may benefit the staff and the University's broad interest in serving society. It is further mentioned in the policy that direct benefits that are likely to arise from consultancies include building links between the university and outside bodies for the purpose of gaining research contracts, placing students for project work, and recruiting students for advanced or continuing professional education. According to the policy another envisaged benefit of engaging with industry is to increase the expertise and experience of university staff by involving them in addressing real world problems, thus enriching their teaching and research.

This policy indeed recognises the benefits of the UIL, mostly from the side of the academic staff. It thus encourages staff – but does not oblige them to form linkages. The policy puts more emphasis on the monetary gains that staff would generate from the consultancy assignments. If, for example, member staffs do not declare a consultancy project, and thus the income generated, his/her consultancy report would

not be considered as an academic work that could be used for promotion. There was a general outcry by UCB that staffs were conducting consultancy assignments and thus using university time and facilities but they were not declaring those assignments and incomes generated therefrom.

Sokoine University of Agriculture Corporate Strategic Plan

Sokoine University of Agriculture (SUA)'s mission statement is to "promote development through training, research, and provision of services to the public and private sector in an environmentally friendly manner". On the list of SUA's objectives, those that are relevant to UIL include the following:-

- To undertake basic and applied research to generate new knowledge that responds to the contemporary and emerging needs of society;
- To contribute to the development process through dissemination of research results, technologies and provision of quality services;
- To improve the contribution of research to development ; and
- To improve advisory services.

On UIL, SUA's corporate strategic plan mentions that the university has signed several Memoranda of Understanding (MoUs) with local, regional and international organisations. Some of these organisations have supported SUA by providing funds for research and training, while others have collaborated in activities funded by their organisations. Some of the MoUs are still active but others are dormant without any activity going on. The need to deliberately establish linkages with the private sector is emphasized.

SUA recognises its weaknesses by including "inadequate funding for academic r esearch, outreach and other services"; "inadequate basic research"; "limited level of entrepreneurship and business acumen amongst staff". On the side of threats, the following are among others found to be relevant to this study: - "inadequate government and donor support"; and "difficulty in convincing the private sector and government to fund good basic research".

On outreach services SUA has promulgated two activities, namely "to contribute to the development process through dissemination of research results, technologies and provision of quality services"; and "to improve the contribution of research to development"

Umbrella Organizations

This study could not establish the existence of policies on UIL from umbrella organisations like Confederation of Tanzania Industries, Chamber of Commerce, Industry and Trade; Bankers' Associations; professional associations; political parties; and international agencies. None of the above was found to have a clear or even an implied policy on how it expected to link up with universities in the country or abroad.

The role played by intermediary organizations in UIL

The Tanzania Commission for Universities (TUC*)*

TUC is charged with the role of promoting the objectives of Tanzania's higher education policy, processing applications for the establishment and management of higher education institutions in the country and recognize, registering and accrediting them. Other roles of the Commission include coordinating and ensuring fair play in the selection and admission of students, monitoring and ensuring the quality of higher education by evaluating and validating academic programmes and recognizing qualifications obtained from institutions which do not have TUC recognition and accreditation. The Commission also gives advice to individuals, organizations, institutions and the Government relating to the growth, relevance and quality assurance of the higher education provided in Tanzania. Promotion of UIL is implied from the roles of the Commission, and indeed TUC plays a pivotal role in trying to bridge the gap between universities and industry by organising exhibitions of institutions of higher learning. Through these exhibitions, higher learning institutions are expected to market and promote themselves in the eyes of the public.

The Tanzania Commission for Science and Technology (COSTECH)

COSTECH is a government-owned institution under the MSTHE, entrusted with the responsibility of coordinating and promoting science the development of and technology in the country. COSTECH is the principal advisor to the government on all matters pertaining to science and technology and its application to the socio-economic development of the country.

In its strategic plan, COSTECH identifies its weaknesses and threats to include, amongst other things, "...weak linkages and working relationship between the science and technology community and policy makers as well as between research and development institutions and academia and productive activities"; "inadequate funding

by government"; "inadequate capacity to address technology development and transfer issues"; and "being accountable to only one ministry while dealing with issues cutting across many ministries".

Among its strategic objectives COSTECH's strategic objective number 11 is to "promote national, regional and intermediate cooperation, linkages and networks amongst science and technology stakeholders". In order to attain this objective COSTECH formulated two strategies, i.e. "to establish linkages and networks" and "to publicise national research and development institutions".

Tanzania Industrial Research and Development (TIRDO)

TIRDO is a multidisciplinary research and development organisation established in 1979 to facilitate industrial development in Tanzania. According to TIRDO's strategic plan the institution has had significant achievements in terms of research, service to industry and development of industrial technologies. It has also established networks with a number of international, regional and local institutions.

In its self-evaluation TIRDO identified its weaknesses to include inadequate linkages between itself and industry. TIRDO's strategic objective number seven is to increase the number and productivity of national and international linkages.

METHODOLOGY

The Sample

The study used two universities in Tanzania as case studies, i.e. UDSM and SUA. UDSM is the oldest and largest university in Tanzania, far larger than all other state and private universities in terms of programmes, student' intake and staffing. UDSM is a well established comprehensive University with almost all areas of study. SUA specialises in agriculture and allied science areas of study not offered by UDSM. The remaining universities in Tanzania are relatively new and specialise in one or a few areas of study. UDSM and SUA were therefore two good cases that could demonstrate the experiences of university-industry linkages in Tanzania.

It is estimated that Dar es Salaam city, the commercial centre of the country, is the home of more than sixty percent of businesses in Tanzania. UDSM and SUA are more likely to link with businesses operating in Dar es Salaam than those operating elsewhere. Our sample of businesses was thus conveniently drawn from those operating in Dar es Salaam only.

With respect to government policies governing UIL in Tanzania, this study limited itself to two ministries, i.e., the Ministry of Science, Technology and Higher Education and the Ministry of Industries Trade and Marketing (MITM). MSTHE deals with policy matters governing higher education in Tanzania, as well as intermediary institutions which, in one way or another, facilitates higher education institutions in Tanzania. The MITM administers the operations of businesses including SMEs in Tanzania.

Data collection

Government policies were reviewed and interviews were held with top government officials, top officials of universities and with officials of government agencies.

The main research instruments used to collect primary data were questionnaires and interviews. Two sets of semi-structured questionnaires were used, one for and the other for university units. The major part of the questionnaire contained questions relating specifically to their relationship with universities. They were asked to indicate whether they had any kind of linkage with universities, and if they did, to show the areas in which they thought those linkages made the most impact on their growth and competitiveness. Firms were also asked to suggest areas to which they thought universities could contribute most in improving the operations of firms in Tanzania.

The university questionnaire requested respondents to indicate the economic sectors they linked with the most, the areas on which they thought they made the most impact with respect to UIL, and the types and sizes of firms they linked up with. University units were further requested to rank different areas of UIL in the order of importance, and were asked to suggest how they could best link up with industry.

In addition to responses to the questionnaires, some business leaders and university officials were interviewed to clarify and elaborate more on some of their responses in the questionnaire. The interviews were found to be quite informative. Further interviews were conducted with government officials and officials of government agencies on policy issues regarding UIL in Tanzania.

Secondary data was also collected from published records such as policy documents, particularly those of NHEP, NSTP, NTP, SIDP and SME policy. Other sources of secondary data used included university publications like prospectuses, calendars, strategic plan, Facts and Figures and newsletters.

Description of the sample

Universities

Questionnaires were served to all faculty/school deans, institute directors and heads of department. Responses were discussed through interviews with the respondents who were available so as to clarify and get more insight into on the questionnaire responses. For logistical reasons the former Muhimbili University College of Health Sciences of the UDSM and Moshi University College of Cooperative and Business studies of SUA were not included in the study.

From the main campuses of the UDSM and SUA, 109 respondents were targeted for serving questionnaires and conducting interviews with, included top university administrators, college principals, faculty deans, institute/bureaux/centre directors and heads of department. Sixty two questionnaires with usable responses were collected, a response rate of about 56% of the targeted population, which is deemed adequate for such a study. Seventeen university officials availed us with interviews.

Businesses surveyed

Fifty businesses operating in Dar es Salaam were selected randomly, using a business directory by BRELA for serving questionnaires and conducting interviews with. Thirty five returned the questionnaires with meaningful responses but only 15 granted us interviews.

In order to classify firms by size, one of the questions in the questionnaire requested firms to give the number of their employees and the value of capital employed. They were also requested to classify themselves as either micro, small, medium or large. The self-definition of the surveyed firms was consistent with the definition of firms by the MITM SME policy[3]. Twenty eight firms, i.e. 80% of the firms that were surveyed, were classified as either small or medium. 25 firms, i.e. about 71% of the sample, had been in business for between two and fifteen years. Only two firms, both of which happened to be large, had been in operation for more than 15 years. The size and age characteristics of the surveyed firms are summarised in table 1.

Table 1: Size of surveyed firms by their age in business

Firms by size	Number of years in business				
	Below 2 years	**Between 2 and 7 yrs**	**Between 8 and 15 years**	**Above 15 years**	**Total**
Micro	3	2	0	0	5
Small	2	8	5	0	15
Medium	3	9	1	0	13
Large	0	0	0	2	2
Total	8	19	6	2	35

When the surveyed firms were classified by industry, the industry/field that had the highest representation was "handicraft", which represented 20% of all the sampled firms. Engineering including metal works had the next high representation. Building, construction and real estate; communication; food and beverages processing amd NGOs were in equal place, each representing about 9% of the sampled firms. A full classification by industry of the firms surveyed is depicted in table 2.

Table 2: Classification of sampled firms by field/industry

Industry	**Size of the firm**				
	Micro	**Small**	**Medium**	**Large**	**Total**
Handicraft		7			7
Engineering (mechanical, electrical, process, precision, etc.)		1	4		5
Building, construction and real estate		2	1		3
Communication (telephone, post, broadcasting, television, etc.)			2	1	3
Food and beverages processing	2	1			3
Manufacturing (textiles, metal/woodwork, etc.)	3				3
Non-profit Organizations (NGO) (including political parties, religious organizations, etc.)		2	1		3
Agriculture, forestry and fisheries		2			2
Health care, medicine and pharmacy			2		2
Banking, Finance and Insurance				1	1
Mining, energy and water			1		1
Trade and tourism			1		1
Transportation			1		1
Total	5	15	13	2	35

All except three of the surveyed firms recruited graduates from local training institutions only. Of the three firms that recruited graduates from both local and foreign training institutions, one was a large firm and the other two were medium sized

firms. This was an indication that recruitment of graduates from training institutions outside the country was dependent on the size of a firm.

More than 85% of the surveyed firms had no training programme for their employees. The two large firms in the sample had training programmes that were in-house and outsourced. The other three firms that had training programmes were medium sized, two of which conducted training in-house and one trained its employees within and outside the company. Table 3 summarises the above characteristics of the sampled firms.

Table 3: Employee training programme of surveyed firms

Firms by size	Existence of employee training programme				
	Yes			No training programme	Total
	In-house only	Outsourced only	In-house and outsourced		
Micro	0	0		5	5
Small	0	0		15	15
Medium	2	0	1	10	13
Large	0	0	2	0	2
Total	2	0	3	30	35

For the surveyed firms, employment of graduates with university degrees depended on the size of the firm. None of the micro firms and the majority of small firms employed staff with university degrees. However, large firms had several employees with university degrees in various disciplines as summarised in table 4.

Table 4: Number of employees with university degrees by firm size

Firm by size	Number of employees with University degree	Profession Type of a job					
		Manage-ment	Produ-ction	Sales/ Distribution	Order Processing	R & D	Accounting
Micro	Between 1 and 3	0	0	0	0	0	0
	Between 4 and 10	0	0	0	0	0	0
	Above 10	0	0	0	0	0	0
Small	Between 1 and 3	3	0	2	0	0	1
	Between 4 and 10	0	0	0	0	0	0
	Above 10	0	0	0	0	0	0
Medium	Between 1 and 3	11	2	2	3	0	7
	Between 4 and 10	0	0	0	0	0	0
	Above 10	0	0	0	0	0	0
Large	Between 1 and 3	1	0	0	0	0	0
	Between 4 and 10	1	0	1	0	0	2
	Above 10	0	0	0	0	0	0

Government Ministries and Institutions

As earlier mentioned, two ministries were purposefully selected for this study, MSTHE, the mother ministry for higher education, science and technology, and MITM, which deals with all industries the marketing of goods and services. We also sought to interview executives of public institutions under the two ministries facilitating higher education, industrial research and/or the business environment. Subsequently four top officials from government ministries, seven officials of public agencies and umbrella organisations were interviewed. Primary data collected was supplemented by published secondary data obtained from publicly available documents and reports.

Public agencies and umbrella organisations whose officials were interviewed were Confederation of Industries, Tanzania Private Sector Foundation, National Business Council, Tanzania Chamber of Commerce and Industry and Agriculture, COSTECH, TIRDO and Business Environment Strengthening Programme in Tanzania.

Data analysis

The questionnaires that were returned with usable information from firms were grouped into four control groups based on size, i.e. micro (five firms), small (fifteen firms), and medium (with thirteen firms) and large (two firms). Most of the analysis was thus done by comparing firms of different sizes.

University units were classified into three major groups. The first group contained units that offered programmes in liberal arts like social sciences, business, law, etc. Under this group 27 usable questionnaires were subjected to analysis. The second group contained units that offered pure science, engineering and technology-related studies. This group contained all faculties under College of Engineering and Technology (COET), the former University College of Lands and Architectural Studies and the faculty of Science at the UDSM main campus. Twenty two questionnaires were in this category. The last group contained units that offered agriculture and allied sciences, and basically all these were at SUA. Thirteen questionnaires were in this category. Table 5 shows the classification of university units and the number of usable questionnaires received for each classification.

Table 5: Classification of university units surveyed and the number of usable questionnaires received from each classification

Classification	Number of usable questionnaires received
Liberal arts	27
Engineering and Technology	22
Agriculture and allied sciences	13
Total usable questionnaires received	62

STUDY FINDINGS

Identified firms and types of interaction

Firms linkage with universities

The results of the survey show that only ten out of the thirty five surveyed firms had interactions with universities. As shown in table 6, interaction seemed to be related to the size of a firm. Both large firms and about half of the medium firms reported to be interacting with universities, whereas all micro firms and thirteen out of fifteen small firms reported not to be interacting with universities whatsoever. The proportion of firms having linkages with universities increased with firm size.

Table 6: University – Industry Interaction by firm size

Firms by size	University – Industry Interaction status		
	Yes	No	Total
Micro	0	5	5
Small	2	13	15
Medium	6	7	13
Large	2	0	2
	10	25	35

The implication of this finding is that it was unlikely to find micro and small firms having linkages with universities, probably because the management of these firms was less educated, and hence not in a position to appreciate the potential benefits of linking with universities. It was also likely that the business activities that micro and small firms were engaged in were simple and did not attract or call for intervention from university expertise. However, these micro and small firms were the ones that needed technological interventions and technical expertise for them to grow to middle level and subsequently to large scale. The major challenge was how to remove the barriers, psychological or otherwise, between micro and small firms on the one hand and universities on the other.

One very important issue that was beyond the scope of this study but needs to be investigated further is the evolution of the linkages that were in existence and the lessons that could be learnt from their genesis.

Areas in which firms thought UIL made the most impact

A list of areas was given to firms to indicate where they thought the linkage with universities had made the most impact. The list was summarised from literature on UIL. The responses given by the firms are summarised in table 7. As it will be noted, areas that were mentioned most by the responding firms are "Stimulating Entrepreneurship", "Giving information to students", "Participating in conferences", "Consultancy services" and "Alumni Association". Other areas that were mentioned by a couple of firms were "Influencing curriculum of university programme", "being on academics in boards of firms" and "contract research".

That stimulating of entrepreneurship was mentioned by many firms was a reflection of the efforts made by the University of Dar es Salaam Entrepreneurship Centre (UDEC), the former Faculty of Commerce and Management (FCM) now Business School and the COET in providing short-term training programmes for Tanzanian entrepreneurs. UDEC and FCM have for example conducted a lot of programmes for entrepreneurs

and for firms that facilitate SMEs in Tanzania. In addition, it was then UDSM policy that all its students were provided with basic training in entrepreneurship for them to appreciate the benefits of being entrepreneurial. Also all academic members of staff at UDSM are being encouraged to undergo a basic training course that would inculcate entrepreneurial tendencies in them. The course is provided by UDEC, in collaboration with FCM and the Centre for Continuing Education of the UDSM.

Giving information to students must was mentioned by many firms because many students visit them while doing field assignments. Also most university programmes require students to be attached to firms for a specified period during their study period. One important observation was that most of the areas mentioned by the surveyed firms were not strong areas that were likely to make SMEs competitive. Areas that were not mentioned but which were more likely to make SMEs competitive were "joint research and development", "incubation", "exchange of personnel", and "financing of research".

Table 7: Firms' views on areas on which UIL made the most impact

Areas in which UIL makes the most impact	Firms by size				
	Micro	Small	Medium	Large	Total
Stimulating entrepreneurship	3	5	6		14
Giving information to students		1	5	2	8
Participation in conferences		2	4	2	8
Consultancy services		1	5	2	8
Alumni association		1	4	2	7
Influencing curriculum of university programmes			4	1	5
Academics being on boards of firms			4	1	5
Contract research			3	1	4
Supervision of trainees and/or PhD students			2	1	3
Start-ups		1	2		3
Networks based on friendship			2	1	3
Mobility from University to industry				2	2
Mobility from industry to University				2	2
Contract education or training			1	1	2
Retraining of employees			1	1	2
Working students		1	1		2
Sponsoring of research				1	1
Scientific publications				1	1

University linkage with industry

Types of firms that Universities linked up most with

The Economic sectors with which universities were linked most were education, commerce, engineering, communication, and manufacturing. Most of the economic sectors mentioned were very important for making SMEs competitive. However,

mining and public health were not mentioned by many university units as being their priority sectors, but they are equally important in terms of UIL. The mining sector in Tanzania has been growing very fast and has become one of the most important sectors of the Tanzania economy. The sector has the potential of benefiting very much from UIL. The public health sector was not mentioned by many units because our sampled university units did not include Health sciences. However, the fight against the scourge of HIV/AIDS, against malaria, and many other health-related problems in Tanzania could not succeed without the interaction of the health science university units and society. Table 8 presents the summarised results of sectors with which university units are linked most.

Table 8: Economic sectors with which universities are linked most

Economic sectors	Classification of University units			
	Liberal arts	Engineering & Technology	Agriculture & allied sciences	Total
Commerce	14	14	10	38
Education	21	6	8	35
Engineering	4	22	5	31
Communication	19	12	0	31
Manufacturing	3	18	9	30
Tourism	16	7	1	26
Agriculture	4	8	13	25
Public health	12	4	2	18
Mining	2	6	0	8

When the firms that universities linked with most were looked at from the point of view of size, ownership and origin, university units tended to link up more with micro/small firms than with large firms. This finding rather contradicted the earlier finding from firms, which showed that larger firms tended to have linkages with universities rather than smaller firms. This finding may not conclusive evidence as the number of large firms was too small to be compared with small firms.

Table 9: Types of firms with which universities linked most with

Classification of firms by size, ownership and origin	Firm sizes	Classification of university units			
		Liberal arts	**Engineering & Technology**	**Agriculture & allied sciences**	**Total**
Size	Small	9	16	10	35
	Medium	8	4	3	15
	Large	10	2	0	12
Ownership	Private	5	17	4	27
	Government	15	3	5	23
	NGO	7	2	4	13
Origin or Nationality	Domestic	27	22	13	62
	Foreign	0	0	0	0

However when university units were looked at in terms of their areas of specialisation, liberal arts tended to deal with larger firms, whereas engineering and technology, agriculture and allied science units tended to deal more with smaller than larger firms, as depicted in table 9. This observation indicates that linkage in the engineering and technology-related areas in the right direction. The UIL is likely to make more impact on smaller firms than on larger firms. The private sector in Tanzania is the driving force of the economy. It was thus interesting to note that university units, particularly engineering and technology, indicated dealing more with private firms than with government institutions. However, as expected, liberal arts-related university units are linked more with government institutions than with private firms. All university institutions surveyed indicated being linked most with local institutions, although this did not imply that they did not link with foreign institutions.

Areas on which universities thought they made most impact

Table 10 summarises the responses from university units as to the areas they thought they made most impact with respect to UIL.

Table 10: Areas in which Universities thought they made the most UIL impact

Areas in which universities made the most UIL impact	Classification of University units			
	Liberal arts	**Engineering & Technology**	**Agriculture & allied sciences**	**Total**
Training and retraining of employees	31	30	27	108
Working with students	26	21	18	65
Consultancy services	27	22	13	62
Networks based on friendship	26	22	13	61
Alumni association	27	22	13	61
Participation in conferences	25	20	13	58
Supervision and or financing of trainees and PhD research	22	18	12	52
Influencing curriculum of university programmes	26	20	6	52
Academics being on boards of firms	22	16	11	49
Being on faculty boards	20	18	10	48
Matters relating to Publications	10	15	12	37
Contract research	18	11	7	36
Mobility from University to industry	4	9	3	29
Start-ups including incubation at universities	6	12	9	27
Exchange in professional organisations	7	10	6	23
Exchange of personnel from industry to university	6	11	3	20
Sponsoring of research and joint R&D projects	2	16	11	16
Stimulating entrepreneurship	5	4	5	14
Sponsoring education	3	6	1	10
Mobility between universities	3	4	2	9
Sharing laboratories, machines and other facilities	0	6	2	8
Providing scholarships		5	2	7
Double appointment	2	1	2	5
Contract advertisement	2	1		3
Co-patenting			2	2

The areas that scored highest were “training and retraining of employees”; “working with students”; “consultancy services” “networks based on friendship, “alumni associations”, “participation in conferences”, “supervision and/or financing of trainees and PhD research” and “influencing curricula of university programmes”. Other areas that were mentioned by the surveyed university units were academics being on boards of firms”, being on faculty boards”, and “matters relating to publications”. Looking at the list of areas mentioned by university units in table 10, those topping the list, except for “provision of consultancy services”, were, in our opinion, not areas that were likely to make firms competitive. Engineering and technology-related areas like start-ups, incubation, research, patenting, science parks, etc., were not mentioned by many university units as areas in which they were likely to make much impact.

Areas that were not mentioned at all by university units were acquisition of licences, copyrights and other forms of intellectual property rights, information via patents, purchase of prototypes and spin-offs. These were, in our opinion, areas that should have come top of the list, given their potential contribution to making firms more competitive.

Cases to demonstrate the success and failure of linkages between universities and industry

One of the objectives of conducting interviews with university units as well as with the sampled firms was to find out whether there had been any initiatives from either side to form university-industry linkages. One notable observation was that none of the sampled firms that granted us interviews had a case to demonstrate that it had initiated efforts to form a linkage with universities. Whereas it was possible that the sample of firms was biased against firms that were active in terms of initiating linkages, it is much more likely that most Tanzanian firms have not been proactive in forming linkages with universities.

Several cases were however noted on the part of university units, which demonstrated success and/ or failure in their efforts to form link with industries. For example, UDEC had several cases where it had initiated linkages with industry in areas such as project incubation, provision of business advice, informal corroboration with chief executives of firms, etc. Many of UDEC's initiatives were successful, although a few were not, and notably, one did not succeed because it was frustrated by UDSM bureaucracy. Likewise, FCM, Technology Development and Transfer Centre, the Bureau of Industrial Cooperation, and COET all had success and failure stories in their initiatives to establish UIL. In addition to the University units, other institutions that were found to be facilitating UIL included the Tanzania Commission of Universities, which had organised several exhibitions for institutions of higher learning to interact with industry.

CONCLUSION

The importance of the role played by universities in Tanzania in the provision of skilled manpower to the economy is undisputable. The number of universities in Tanzania has increased rapidly over the last few years, and the old universities like the UDSM and SUA have expanded tremendously in terms of programmes and enrolment. Likewise, the number of graduates flowing from universities into the job market has equally increased. It is evident from findings of this study that there already exists a linkage between universities and industry, although of the surveyed firms, not many

indicated having solid links with universities. The types of linkages observed were mainly informal and not very significant in terms of contribution to the development of the economy and enhancing SMEs' competitiveness.

The importance and relevance of the UIL in making firms competitive was greatly appreciated by businesses, universities and the government. Indeed the government and universities in Tanzania already have policies in place for propagating UIL. Businesses however do not have policies that guide them in that direction.

Between 1990 and 1999, the SME sector made a significant contribution of about 32% to Tanzania's GDP (Ayyagari, Meghana et al. (2003). Despite their significant importance small firms are less likely to appreciate the importance of UIL than large firms because of their low level of exposure and literacy of their management.

Despite the existence of University policies that encourage UIL and which require university faculties/departments to justify their role and existence by making themselves relevant to society, there are no clear strategies to guide university units as to how linkages should be formulated. As a result, the kinds of linkages that exist are more dependent on the people in offices with few institutional framework guidelines. Other links are donor driven and many University units are neither proactive nor aggressive in forging links with industry. Universities are still having the mentality of being in ivory towers with a big gap between them and industry. On the other side, some of the firms, particularly SMEs, are not sure of the kind of benefit they could enjoy from UIL. Other business practitioners look down on academicians as theoreticians with no relevant or practical experience in how to solve real life problems and hence nothing to offer to them. In such circumstances the environment in Tanzania was not very conducive for fostering UIL.

Government policies are in black and white about the need and importance of science and technology institutions linking with industry. COSTECH was established to facilitate the transfer of technology from science and technology institutions to industry. However, this institution was observed to be not properly playing its role. Academic institutions were not seeing much being done by this institution in terms of facilitating them to link with industry. On the other hand this coordinating institution and many other science and technology industries are seriously under-financed by the government. There is no way this institution could be expected to play role and to function with the budget receives.

Given the existing linkages, informal as some of them are, there have definitely been a lot of mutual advantages. From the point of view of industry, universities have been

the main source of skilled manpower. The number of graduates from local institutions going into different sectors of the economy has increased tremendously.

Large firms have utilised university professors on their governing boards and advisory committees. Although there is no policy on this, it is common practice that most boards and committees formed by the government and its institutions include members of academia. The SME sector has definitely benefited from interventions like the COET linkage with TGT, and those by UDEC. However, much more could be done.

Universities have equally benefited from linkages in various forms, as they have provided universities with areas for practical training as well as for research for students and staff. Other linkages have generated funds to supplement the meagre university budgets.

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END NOTE

[1] Mersha (2006): Benefits of Higher Institutions – Industry linkages: Ethiopian News Agency
[2] UCB Consultancy Policy and Procedures of April 2005
[3] According to the SME policy, micro enterprises are those engaging up to 4 people, in most cases family members or employing capital amounting up to 5 million shillings. The majority of micro enterprises are in the informal sector. Small enterprises are mostly formalised undertakings engaging between 5 and 49 employees or with a capital investment of T.shs 5 million to T.shs 200 million. Medium enterprises employ between 50 and 99 people or use capital investment T.shs 200 million to T.shs 800 million. Large firms employ 100 employees or more and have capital of over T.shs 800 million.