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Can industry-university linkages stimulate student employability?
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# Can Industry-University Linkages stimulate student employability?

## Introduction

Developing countries are facing challenges in relation to unemployment. A soaring number of highly educated people are therefore unemployable (Nuwagaba, 2012), while unemployment of graduates is a rising trend (Mbah, 2014). This situation is associated with a lack of competitive skills demanded within the labour market (Nuwagaba, 2012). Paradoxically, many of these countries also have an excess of natural resources, e.g. oil, gas and minerals. These resources are very attractive to foreign companies, usually multinational enterprises (MNEs), which have both the resources and motives to improve the work-life relevancy of the higher knowledge sector.

Foreign-based companies and suppliers are highly involved in the exploration and exploitation of natural resources in African countries. Whereas the mining industry has been continuously ongoing for hundreds of years, the petroleum industry is relatively new to sub-Saharan nations. Oil and gas nations such as Nigeria, Angola, Libya and Algeria have involved MNEs in the exploration and exploitation of oil and gas resources for decades. Like these countries, new oil and gas nations such as Ghana, Uganda, Tanzania and Mozambique are facing new challenges in applying natural resources as a means of creating national wealth. Regardless of the maturity and technological content in the industry, foreign MNEs increasingly face explicit expectations to involve local suppliers in the petroleum value chain, and to recruit local people for the benefit of the host nation (Vaaland and Owusu, 2013). However, like many emerging petroleum and mining nations, the industrial base has a long way to go in order to be qualified as internationally competent suppliers, and to provide the industry with highly skilled human capacities. In the early stages of the development of the petroleum and mining sector in particular, the capacity to meet professional industry requirements is likely to be low, especially in countries that lack an industrial base (Tordo *et al*., 2013). Indeed, the Tanzanian government acknowledges the presence of skill shortages across the extractive industry (particularly with oil and gas) value chain, although it still requires the MNEs to involve Tanzanians as their workers and suppliers (United Republic of Tanzania – URT, 2014). It further challenges higher learning institutions in their role to meet industrial expectations by training and educating young people, although it acknowledges their shortages of experienced faculty members with specialized skills in extractive industry, particularly oil and gas. It calls for partnerships with MNEs in enhancing universities for building the competencies of Tanzanians to enable them participate in the extractive industry as suppliers of labour, services and material inputs.

To help meet their obligations (i.e. to offer relevant education and skills for the industry) and respond to the government call, some universities in emerging economies have established collaborative arrangements with the industry in terms of university-industry linkages (UILs). These linkages can be defined as *interactions between all parts of the higher educational system and industrializing economy* (Ankrah et al., 2013). Many scholars (e.g. Hansen and Lehmann, 2006; Feng *et al*., 2011) argue that partnerships between universities, business and civil society are prerequisites for improved economic development. Furthermore, changes in the global economy have enabled the requirement for flexibility, adaptability and innovation, which have led to new education and training demands in order to be competitive (Ramdass, 2012). Many studies of UIL and their effect on economic development have been carried out in a highly industrialized country context. Ankrah *et al.* (2013) provide a list of 57 empirical studies of an academic engagement with industry between 1990 and 2011, and none of these applies a developing country context. Studies by, e.g. Alpert *et al*. (2009), Perkmann *et al*. (2011) and Afonso *et al*. (2012) were conducted in relatively advanced countries,

where universities possess a strong infrastructure for conducting research and development activities, adequately skilled personnel and the availability of financial resources. In this context, one can assume a more symmetrical power balance between the industry and the university, compared to the developing country. Most of the universities in emerging economies in Africa, including Tanzania, suffer from a weak learning and research infrastructure, limited skilled personnel and insufficient research funds (Mpehongwa, 2013; Makulilo, 2012). The perceptions of key stakeholders (i.e. students, industry and faculty members) on the various effects of UILs activities are therefore likely to differ from those in developed countries.

Most of the empirical studies on UILs in developing countries have focused on factors that determined the nature and presence of UILs. Oyebisi *et al.* (1996) evaluated the strength of UILs in Nigeria and revealed established UILs in consultancy activities and limited UILs in research activities, which were associated with, among others, a lack of institutional support. Schiller and Liefner (2007) assessed the effects of funding reform on the development of UILs in Thailand and their benefits. They revealed that a cut in public spending in universities has stimulated the development of UILs, though the financial benefits to universities and the technological benefits to the industry were limited. Brimble and Doner's (2007) study of UILs in the same country indicates the presence of weak to modest UILs because of a lack of incentives and institutional support. Alves *et al.* (2007) claim that mind-set divergences between academia and industry significantly hamper cooperation. Based on a survey of faculty members in Bolivian universities, Vega-Jurando et al. (2008) also identify constraints hampering the development of UILs. A more recent study of UILs in Tanzania by Mpehongwa (2013) also focuses on the challenges faced in the establishment of UILs.

Other empirical studies of UILs reveal the presence of strong UILs and their potential for economic development. Goosen *et al.* (2001) reveal that the presence of strong UILs in Oman could be related to the presence of modern facilities in universities and the design of undergraduate programmes that incorporated industrial training and universities' policy related to the provision of training to industrial and government personnel.

Based on a survey of 80 students in selected universities in Palestine, Rabayah and Sartawi (2008) assessed the relationship between UILs (practical training in information and communication technology) on students'/trainees' future career and employability. They reported that the practical training programme had a positive effect on employability, as more than 50% of trainees acquired the jobs after the training. The current paper differs from the study by Rabayah and Sartawi (2008) since the former focused on the three categories of UILs (education/training, consultancy and research), while the latter focused on one component of UILs in training only. Hence, it is impossible to identify which of the UILs activities are more important than others.

Based on a survey of 120 organizations that offered placement for industrial training in Ghana, Ayarkwa et al. (2011) assessed the performance of students during the industrial training and the effectiveness or design of the training. They revealed a high potential for students to acquire new skills during the training, which could enhance their employability after the completion of their studies. Like Rabayah and Sartawi (2008), this study focused on one component of UILs activities in training/education that was based on the perceptions of the industry only.
Based on expert interviews and literature, Afonso *et al.* (2012) investigated UILs in Spain (albeit not a developing country), claiming that that the participation of industry professionals in postgraduate courses and students' internships in companies are the UIL activities with the greatest impact on employability.

Faced with the pressure to meet local content, and the need to produce skilled and competent people to help facilitate the attainment of local content, both multinational companies in mining and petroleum and local universities in Tanzania have established UILs in different spheres. Nevertheless, the types of UIL activities with a strong positive effect on students' employability, through equipping them with the proper skills, competencies and attitude, are unknown.

Thus, the aim of the paper is to identify the most important UIL activities for enhancing employability among university students as perceived from three major stakeholders: the student, the faculty member and the industry. These are the same set of stakeholders applied in the study of Bhanugopan and Fish (2009) investigating graduate employability and UILs in a developing country context. The industry informants are basically recruited from large foreign- or joint-venture companies involved in the oil and gas and mining sectors, because they are assumed to possess both the capabilities and resources of relevance to UIL activities, as well as motives for investing in these activities. The focus is not about the existence of UILs, nor about factors hampering or stimulating UILs, but rather the perceived value of various linkage activities in enhancing student employability.

The rest of the paper is organized into six sections. First, a literature review is provided that covers three aspects of UILs followed by methodology. In the third section, findings are presented and then discussed in the fourth section. In the fifth section, implications are suggested, before the last section concludes the paper.

## Literature review

### The role of the main actors in the linkages

A highly-skilled labour force that has the ability to employ new knowledge, technologies, business improvement methodologies, and ultimately the addition of value to existing goods and services, is developed through a broad general higher education system (Ramdass, 2012). Schuetze (2001) argues that universities are primarily educational institutions that produce highly educated graduates. In line with this view, Vega-Jurando et al. (2008) describe three training models related to the university:

Traditional universities build students' skills, both conceptual and practical alike, through traditional lectures, tutorials, seminars and workshops. Academic theories are connected to "simulated practice" or real business cases; nonetheless, this model has received heavy criticism as being inadequate to prepare students for modern work (Ball, 1995). In line with this, McIlveen and Pensiero (2008), Bhanugopan and Fish (2009), Afonso et al. (2012), Nuwagaba (2012) and Torres-Machi et al. (2013) all claim that university training is posed with an increasing challenge in adapting degrees, teaching contents and training methods in order to meet industry demands. Others argue that even though these programmes provide graduates with a mix of skills and competencies required by the business world, a large number of businesses have a wide spectrum of differing requirements. Therefore, it is impossible to fully satisfy the training needs of all sectors (Vega-Jurado et al., 2008). Another framework facilitates *industry-academia interaction* through bringing into the classroom business managers/owners who bring in real issues that are current and significant to the company (ibid). One of the impediments is a limited number of businesses willing to participate, not to mention interaction challenges and hurdles between students and business personnel (ibid, Brimble and Doner, 2007). A third model is to enable the acquisition of professional competence through *separate institutions* positioned in close proximity to the university campus, so as to help facilitate student and faculty access to its resources and to promote collaboration (Rabayah and Sartawi, 2008). This solution helps to prevent academia from incorporating industry-specific courses, and keeps their neutrality and conceptual-centric content intact. The content is tailor-made packages in cooperation with industry, which provides more flexibility in meeting the changing demands and ideas identified by industries (Vega-Jurado et al., 2008).

The continuing discussion of the role of universities has led to the introduction of the *triple helix* system, in which universities are viewed as sources of regional economic development, as the university assumes a crucial role in societies beyond its traditional functions (Etzkowitz, 2002; Saad et al., 2008). Universities have emerged as central actors in the knowledge-based economy, no longer confined to their traditional roles of teaching and conducting primary research (Hamdan et al., 2011), and it is further argued that there is a growing demand on academic institutions to live up to this expectation (Saad et al., 2008). The *triple helix* of relationships between university, industry and

government could be expected to enhance the relevance of universities to developing countries as agents of innovation and sustainable development (ibid). Developing countries should consequently address the question of drawing a balance between the traditional objectives of skill development and the objective of enforcing technological progress (Saad and Zawdie, 2011). In accordance with this argument, Hamdan *et al.* (2011) emphasize that universities need to interact with others in order to be relevant and progressive, and claim that a symbiotic relationship between industry and universities can help foster economic development. It is necessary for the university to collaborate with industry to combine efforts fostering the diffusion of knowledge.

The industry is the other main party in the UILs. The local industrial base in a developing country context is hampered by small-scale disadvantages and a lack of operational efficiency (OECD, 2005). Furthermore, weak organizational structures and formalities in business processes lead to a significant gap between expectations from MNEs and the realities of indigenous firms. Hence, the indigenous industrial actors is assumed to have limited resources to deploy into UILs
However, the industrial base also includes foreign companies, often large multinationals, and some indigenous larger enterprises with both the resources and motives to invest in UIL linkages, not least within energy and mining industries. "Big oil" realizes that their license to operate in this context is dependent on a mutuality and interdependencies with society. These interdependencies can be illustrated by initiatives from the host country in terms of *local content requirements* (Vaaland and Owusu, 2013), in which the foreign company is required to: (1) include local companies in their value chain or actively improve their capabilities and competitive power through qualifying programmes, and (2) employ a locally skilled workforce in their operations (Tordo *et al*., 2013). In this perspective, the foreign company is required to comply with formal expectations as a "license to operate" in the country. But there is one additional argument for investing in UILs: Attractive exploration and exploitation licenses are not solely based on technological/economic criteria, but also on how the company contributes to capacity building within the host country. These initiatives are labelled as social investments, and are included in the *corporate social responsibility* schemes of the companies. The interdependencies with the "resource owner" and the "foreign agent" can thus be motivated by both requirements and compliance, in addition to corporate social responsibility. Both motivations can lead to UIL relationships of benefit to the university, as well as to the foreign company. In addition to motives to invest in the knowledge sector, they also possess valuable technological and managerial capabilities and resources that can add value to the knowledge sector of the host country. For the universities, access to technological skills, systems, processes and business attitudes developed in an international competitive environment can add significant knowledge elements into a host country university if they are included in UIL activities.

In sum, the MNEs (and associated foreign suppliers), and possibly a few indigenous larger competitive enterprises (if any) as well, both have motives to invest in UIL linkages and resources of value to learning and training institutions**.**


**Forms of UILs**

Goosen et al.'s (2001) investigation of UIL linkages in Oman suggests three areas of activities, namely: research and development projects, technical training and short courses and graduate education. Brimble and Doner (2007) follow a similar categorization by suggesting three modality groups of UIL linkages corresponding to the three broad missions of the university sector: (1) training and education-related activities, (2) the provision of services and other consulting activities, and (3) research-related activities. The content of these categories will be presented in the following based on a brief summary of the literature.

Training and education-related activities include visits by students to industrial premises and the organization of career talks by industrialists for university graduates (Suraweera, 1985). A second group can be labelled as *student working experience programmes* or *university-student internships*, in which the student, as an organized part of the educational programme, works in the company for a few

months under joint faculty/industry supervision (Goosen *et al*., 2001; Ayarkwa *et al*., 2012; Hamdan *et al*., 2011; Alpert *et al.,* 2009). This could also be organized as vacation employment and provision to do research projects on industrial premises (Suraweera, 1985). A third sub-group of activities is to involve industrial practitioners in teaching assignments through part-time assignments (Goosen *et al*., 2001; Oyebisi *et al*., 1996; Suraweera, 1985; Toor and Ofori, 2008). Lastly, the UIL linkages can include the organization of short refresher courses for industry personnel (Suraweera, 1985).

Services and other consulting activities can include initiatives to provide faculty members with industrial experience through sabbatical arrangements (Oyebisi *et al*., 1996) or lecturers spending short periods working in the industry (Suraweera, 1985). Others bring in personnel from industry for helping to formulate specific university courses (ibid) and assistance in designing curriculum (Oyebisi *et al*., 1996). In a third sub-group, the university provides simple technological support and advice to firms (Vega-Jurado *et al*., 2008; Suraweera, 1985) or carries out feasibility reports and analytical assignments (Oyebisi *et al*., 1996; Hamdan *et al*., 2011). Lastly, a more mutual contribution includes the co-arrangements of workshops, conferences and seminars (Oyebisi *et al*., 1996; Hamdan *et al*., 2011).

Research-related activities include joint research, contract research and the interchange of research personnel (Hamdan *et al*., 2011; Vega-Jurado *et al*., 2008), which implies collaboration between a university scientist and his counterpart in industry (Suraweera, 1985). A second group is related to sharing physical assets such as equipment, facilities and application packages between the parties (Oyebisi *et al*., 1996; Suraweera, 1985).

The literature also indicates a fourth group of UIL linkage activities that do not directly address specific activities, but rather a more passive industrial sponsorship role: activity-based sponsoring. Through this type of UIL support, the university is expected to develop educational capabilities and activities through grants, gifts and donations (Surawera, 1985). This group includes sponsoring public lectures, seminars, conferences and symposia, books and other publications, postgraduates, the provision of fellowships or research grants for university staff, prizes, awards and competitions by industry for students, not to mention more passive forms of donations such as endowments for buildings and grants for the purchase of equipment to the university. The modalities of UIL linkages are summarized in Appendix 1.

## Student employability and the UILs

Employability is a concept associated with some definitional challenges. One is that the required "skills" and "personal attributes" are likely to vary across the several stages of the employment relationship. For example, the recruitment stage might require attributes other than the later stages of the employment. It is therefore difficult to fully align curriculum/programmes with employability (Bhanugopan and Fish, 2009). One narrow definition of employability is "…the possession by an individual of the qualities and competencies required to meet the changing needs of employers and customers, and thereby help to realise his or her aspirations and potential in work" (Lindsay, 2009, p. 43). In the following, we apply the broader definition suggested by Lindsay (2009, p. 49): "Employability is defined as the possession by an individual of the capacity to gain employment, sustain employment and make progress, in terms of personal and/or career development, while in employment. The individual's possession of this capacity is related to a number of inter-connected individual factors, personal circumstances and external factors."

The notion of graduate employability is increasingly relevant to institutions of higher learning and for the industry, which demands graduates who can readily transfer into the workforce and effectively demonstrate their employability skills (Atlay and Harris, 2000; McIlveen and Pensiero, 2008). McIlveen and Pensiero (2008) emphasize the value of UILs toward the goal of improving graduates' transition into the workforce, whereas student employability (in South Africa) has become an important indicator of educational quality (Maharasoa and Hay, 2001). Mbah's (2014) study from

Cameroon addresses the importance of how the university and its educational system can help foster graduate employability and improve a fragile economy. Nuwagaba (2012) finds that a soaring number of highly educated people (in Uganda) are unemployable due to a lack of competitive skills demanded in the labour market. In sum, the overall quality of the university and more specific student-related activities are highly relevant and attached to graduate employability, particularly in a developing country context.

Several studies emphasize the importance of a combination of students' wider attributes and skills, alongside their subject knowledge and academic skills, in order to be of immediate value to prospective employers and enhance employability (Torres-Machi *et al.*, 2013; Bhanugopan and Fish, 2009). The fundamental issue is how skills and personal attributes are developed through exposure to various "learning experiences" (Bhanugopan and Fish, 2009).

These gaps between what the attributes of the student is offering after years in the university learning domain, and the work-life demand, can be reduced by UILs. The gaps can indirectly be reduced through collaborative research and consulting activities, but the gap can be reduced even more directly through collaborative training and educational activities that affect the individual student (Torres-Machi *et al.*, 2013). Such activities can include customizing education and training to serve the needs of the job market (Nuwagaba, 2012), and the improvement of practical and entrepreneurial skills (Mbah, 2014).

Not all "employability"-inducing activities at a university are related to industry. Mbah's (2014) study from Cameroon emphasizes an inadequate student counselling that leads to students selecting the wrong academic programmes in relation to market demand, or a pure absence of relevant programmes, courses and subjects requested from potential employers.

Even though the MNEs and large industrial actors have a significant role in enhancing graduate employability, some studies (e.g. McIlveen and Pensiero, 2008) emphasize the importance of engaging small- and medium-sized enterprises (SMEs), which have traditionally have been unfamiliar with- or unable to enter the graduate recruitment market. Given the weak indigenous industrial base in developing countries, the potential for actively engaging small local enterprises in UILs should be considered.

The three modality groups of UIL activities and perceived effects on student employability can be summarized in the following conceptual model:

*Figure 1: Conceptual model*
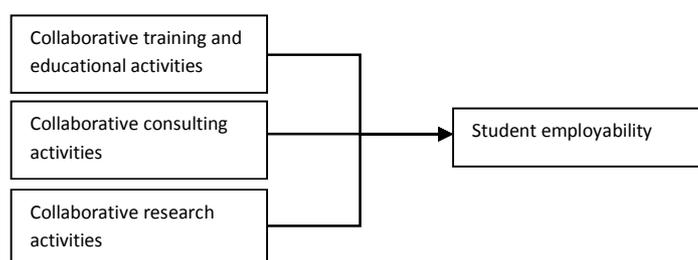


## Methodology

The target population included employees representing the views of extractive companies, students and faculty members from the University of Dar es Salaam and Ardhi University. More specifically, the students and faculty members targeted were involved in academic programmes categorized into social science (viz. business administration and economics) and mining, natural and applied science (viz., mining engineering, mineral processing engineering, geology, engineering geology and environmental science and technology). The selection of these programmes was based on the fact that

they have some linkages with the resource-extraction companies and are therefore relevant for the focus of this study, as it focused on the extractive industry. The duration for selected programmes in social science is three years, while for those in engineering, natural and applied science, it is four years. According to the University of Dar es Salaam's regulations, students in selected social science programmes are required to do their three months of practical training in companies, among which could be the extractive companies. Students in these programmes also have very active associations that organize exchange forums and work closely with companies. Students in engineering, natural and applied science are required to do industrial training at the end of each of their first three academic years. In line with their field of study, they get placement in extractive companies. As a result, the target students for data collection were those in either the third or fourth year of their studies or in the first year of full-time postgraduate programmes. Students in the second year of full-time postgraduate programmes had left the university compounds for the writing of theses during the time when the data was collected.

Tanzania has four of the oldest universities in Africa (viz., the University of Dar es Salaam, which has been involved in nurturing all public universities in Tanzania, Ardhi University, the Sokoine University of Agriculture and the Muhimbili Health Science). The latter two have nothing to do with the extractive (mining, oil and gas) industry, while other universities are young and depend on manpower from the University of Dar es Salaam. Thus, the study focused on the University of Dar es Salaam and Ardhi University because they are the oldest institutions in Tanzania, have some programmes related to the extractive industry and would therefore have more experience in UILs, which would enable their staff and students to offer reliable perspectives about the role of UILs in enhancing employability and innovation. Moreover, the choice of students in their postgraduate- and final year (i.e. at least in the third year) of undergraduate studies is based on the assumption that with their experience in their studies, seminars, workshops and internships in companies, they would be able to provide objective and accurate perspectives about the role of UILs.

In 2014, there were 203 faculty members from the two universities in target programmes as instructors and researchers, of which 121 were in social science and the rest in engineering, natural and applied science (Table 1). In the same year, there were 720 students either in their third year or postgraduate students in selected programmes in social science, while there were 320 in selected programmes in engineering, natural and applied science, thereby comprising a total of 1,040 students. A list of faculty members and students was provided by the administration offices of target departments. Based on the lists, a simple random sampling was applied to select 100 lecturers (i.e. 49% of target lecturers) and 235 students (22% of target students) (Table 1). There was a deliberate attempt made to have more academic members and students from engineering, natural and applied science. One hundred employees from 20 extractive companies were targeted for data collection, though due to a lack of a sampling framework for companies in the extractive industry operating in Tanzania, we compiled a list of 20 firms from the website of the Tanzania Petroleum Development Corporation (www.tpdc-tz.com) and that of the Tanzania Chamber of Minerals and Energy (www.tcme.or.tz). The management of the 20 companies was approached for the data collection, which selected the employees who provided their views that represented the perspectives of the companies. Therefore, 69 employees (with at least one respondent from each of the 20 companies) filled in the questionnaire, with the paper utilizing data from 404 respondents (Table 1).

*------PLEASE SET IN TABLE 1 ABOUT HERE----*

As indicated in Table 1, respondents in the three categories (students, faculty members and company employees) were from the field of social science (29%) and engineering, natural or applied science (71%). Approximately 54% percent of respondents were males, while the rest were females. Twenty-nine percent of faculty members (academics) were professors or senior lecturers, whereas 79 were lecturers or assistant lecturers. The respondents from the companies were Tanzanians (94%) and foreigners (6%).

Based on Brimble and Doner's (2007) framework, the UIL activities were categorized into three areas: training and education, service and consulting activities and research. Using a structured questionnaire

(see Appendix 2), data collection was done by asking respondents to indicate (rate) their perceptions on the importance of UIL activities in enhancing employability. The ratings were done on a Likert scale of 1-5, in which a score 5 = strongly agree, a score 4 = agree, a score 3 = neutral, a score 2= disagree and a score 1 = strongly disagree. Data were analysed using descriptive statistics, whereby mean scores for each factor were estimated and used to rank the importance of factors. Because responses/values on factors/variables for UIL activities were not normally distributed, a Kruskal-Wallis test, which is an alternative to a one-way ANOVA test, was applied to establish the existence of overall differences in perceptions among the three categories of respondents. Furthermore, the Mann-Whitney U–test, which is an alternative to a t-test, was used to determine whether the perceptions of respondents whose academic background was social science differed from those whose background was engineering, natural and applied science. The test for the distribution of responses from students, employees and academics was carried out, and the results (not reported in this paper) show that the distributions for all the activities were similarly skewed to the right for all three groups.

## Findings

*UILs in training, employability effect*

Comparing the perceptions among students, employees (industry) and academics about the importance of UIL activities under training reveals some interesting results. The Kruskal-Wallis test shows that there are very significant differences ($p < 0.01$) on the perceptions of students, industry and academics as to the importance of all UILs in training activities on employability (Table 2, Panel 1).

Descriptive statistics (means) indicate that the industry has a strong opinion on the importance of all UIL training activities in enhancing the employability of students, as their average scores in all activities are above 4. Students have weak perceptions on the importance of all UIL training activities in enhancing employability, with their average scores ranging between 3.99 (slightly below agree) and 3.53 (slightly above neutral). Academics have strong opinions on the importance of three UIL training activities (internship, practical training and practical support) on employability and a weak perception of the last three activities.

*------PLEASE SET IN TABLE 2 ABOUT HERE----*

Results on the ranking of the importance of training activities on employability also reveal interesting results, in which the ranking for four out of the six activities for students and academics were similar, while the industry ranking is quite different for the two groups. Academics and students perceive student internships in companies and the practical training of students in industry premises as first and second, respectively, while the industry perceives them as being second and third. These results square well with the findings by Alpert *et al.* (2009), which revealed that academics and students had very strong opinions that the purpose of the internship programme should be to enhance the placement opportunities of interning students more than the industry does.

Strong disagreement appears on the importance of short-term training to Small- and Medium-sized Enterprises (SMEs) in enhancing employability since industry has a strong perception of this and is ranked number 1, while the academics and students have a weak opinion of it and is ranked number 4. The industry respondents indicate that systematic competence building activities (i.e. short-term courses) targeted toward indigenous companies may breed the ground for future student recruitment. On the other hand, the university informants seem to be more reluctant to this type of activity for leveraging student employability.

It is also interesting to see that the inclusion of guest lecturers from industry into the classrooms seems to be only modestly appreciated, particularly from the perspectives of the students.

Table 2, Panel 2 further presents the results comparing the perceptions of respondents with a **discipline background** in social science, and those in engineering, natural and applied science. The results reveal that the respondents in the two groups ranked the importance of UILs activities

similarly. Although respondents with a background in **social science disciplines** had a stronger opinion in four out of six UILs activities than their counterparts, there was a significant difference ($p < 0.05$) in one activity (industrially experienced lecturers) only.

*UILs in consultancy services, employability effect:*

Regarding the importance of consultancy activities in enhancing student employability, the Kruskal-Wallis test reveals that there are significant differences ($p < 0.05$) on the perceptions of students, companies and faculties (Table 3, Panel 1).

Similar to the findings on UIL training activities, descriptive statistics (means) indicate that the industry has a strong opinion on the importance of all UIL consultancy activities in enhancing employability, as their average scores in all activities are above 4. With the exception of joint projects between students and industry, students have weak perceptions on the importance of other UIL consultancy activities in enhancing employability, as their average scores were below 4 (Table 3, Panel 1). Academics have a strong opinion on the importance of joint projects between students and industry, seminars/conferences and curriculum development, and a weak opinion on sabbatical arrangements and lecturers' engagement in industry consultancies in enhancing employability.

Industry assistance in modernizing and developing university curricula and programmes is regarded as the second most valuable consultancy activity (4.13), which is especially appreciated by industry and faculty informants, though appearing among the students with some reluctance.

------*PLEASE SET IN TABLE 3 ABOUT HERE*----

Although the perceptions of students and academics on the importance of consultancy activities in enhancing employability differ significantly, they appear to position the activities in a similar pattern. Students, academics and industry seem to strongly agree with the importance of joint projects between industry and students in enhancing employability, as the activity is placed at numbers 1 and 2. Students, academics and industry place consultancy assignments by faculty members at number 4 when it comes to its role in enhancing employability.

It is also interesting to see that sabbatical arrangements, in which faculty members gain practical experience from industry, and presumably more relevant teaching, are not appreciated very much by students for enhancing their job opportunities.

A further analysis comparing the perceptions of respondents on UIL activities in consultancy based on **discipline background** still reveal respondents with a social science background to have a strong opinion in 4 out of 5 activities (Table 3, Panel 2). The Mann-Whitney U–test showed that respondents with a social science background had a stronger opinion on the importance of sabbatical arrangements, in which university teachers spend time in the local industry or abroad, at seminars and conferences arranged jointly by faculty and industry and with joint projects between students and industry than their counterparts, and the differences between the opinion of the two groups were statistically significant ($p < 0.05$). The ranking of the activities (except for the joint projects between students and industry) was also different. While respondents with a social science background ranked seminars and conferences arranged jointly by faculty and industry as second, their counterparts ranked it as third. Respondents with an engineering, natural and applied science background had a stronger opinion on the importance of industry assistance in modernizing and developing university curricula and programmes in enhancing students' employability than those with a social science background. The former ranked the activity at number 2, whereas the latter ranked it at number 3.

*UIL in research, employability effect*

Results from the Kruskal-Wallis test comparing the perceptions of students, industry and academics on the role of UIL research activities in enhancing employability reveal that there are significant differences (p < 0.05) among the three groups (Table 4, Panel 1).

Descriptive statistics (means) show that students have weak perceptions on the importance of research activities in enhancing employability (Table 4). Similar to the findings on UIL training and consultancy activities, the industry strongly believes that all UIL research activities improve employability, with their average scores in all activities being above 4. They strongly believe that joint industry-university research increases student employability. Surprisingly, academics and students have a weak opinion on the role of the sharing of specialized resources in enhancing employability. A further analysis based on the **discipline** background of respondents may offer additional information, as those in the social science departments of universities may have a weak opinion because they do not need highly specialized research facilities, while those in the natural and applied science departments of universities may have a strong opinion (see Perkmann *et al.*, 2011).

*------PLEASE SET IN TABLE 4 ABOUT HERE----*

The results on the ranking of UIL research activities demonstrate interesting results. Based on average scores, students' positioning of all research activities was very similar to that of industry, but quite different from that of academics. An incongruence in positioning appears in the ranking of joint industry-university research, which is placed second by academics, but fifth and fourth by students and industry, respectively. Moreover, academics place the sharing of research facilities in fifth place, though students and industry place them third. While students and industry place research for local companies at number 1, academics place it at number 3.

Results comparing the perceptions of respondents based on discipline background reveal that those with an engineering, natural and applied science background had a stronger opinion on the sharing of specialized equipment than those with a social science background, although the difference among them was statistically insignificant. On the other hand, the latter had a stronger opinion on joint industry-university research than the former group, but the difference was weakly significant. The two groups of respondents ranked the two research activities similarly.

Engineering, natural and applied science disciplines require labs comprising standard up-to-date equipment for learning and research. Universities in Tanzania and other developing countries have limited research funds, and are therefore unable to keep their labs with up-to-date equipment. Hence, the sharing of specialized equipment with multinational companies in the extractive industry seems the best option for enhancing the quality of education and research, and thus, the employability of students.

## Discussion

*Importance of UILs in general*

The results indicate that UILs are considered important. The lowest mean value among all UIL activities is 3.7 (guest lecturers from industry) on a scale from 1-5. Most of the other activities are in the 4-5 range, which clearly confirm the importance of UILs. This is not surprising in comparison with previous studies on UILs (i.e. Goosen et al., 2001; Hansen and Lehmann, 2006; Vega-Jurado et al., 2008; Hamdan et al., 2011; Ayarkwa et al., 2011; Afonso et al., 2012). These studies employed a broader set of effects than employability, but all types of UILs have an implication on the "quality" of the university and its output, in which the attractiveness of the students in the labour market is but one crucial indicator.

We suggest that all UIL activities produce some effect on student employability, directly and indirectly depending on whether the activity is specifically targeting the student, e.g. student

internships, or more indirectly in terms of influencing curriculum, joint research or efforts to "industrialize" faculty towards industrial relevance and needs.

However, the motives behind UILs may differ among the stakeholders. The industry might be focused on accessing graduates ready to fit into existing institutional frames and processes. One challenge here is that these "motives" could be significantly different between a MNE investing in a UIL, and a Tanzanian local firm attempting to meet international standards and a certain level of competitiveness. The faculty's motives for UILs can be to access industry resources for improving infrastructure and capacities, without losing their academic independence (see Vega-Jurado et al., 2008). The student's motives are assumed to particularly appreciate UILs in improving their likelihood of immediate employment. In sum, the challenge is to develop UILs to sustain a triple-helix in such a way that the output from the university really improves human capital for economic development in a developing country.

*Differences between the three modality groups*

Our findings indicate that all three modality groups play a significant role in enhancing employability. Student internships and practical training in industry premises (education and training), joint student-industry projects and industry assistance in modernizing curricula (consultancy services) and joint industry-university research (research) are ranked highest among all UIL activities. These findings corresponds with, e.g. Goosen et al. (2001), Afonso et al., (2012) and Ayarkwa et al. (2011), who emphasize the importance of applying both direct student-oriented- and more indirect mechanisms (in all three modality groups) to help enhance employability. We would still intuitively argue that in order to enhance student employability, UIL activities directly involving the student should be the focus in the short run.

*The most important UILs*

Student internships in companies, in the uppermost cases this refers to MNEs having formalized internship programmes, are considered to be the most important activity (mean=4.22). These internships are closely related to the second activity, which allows students to have practical training at industry premises (mean=4.18). These activities receive the strongest support by both industry and faculty, with a somewhat lower perceived effect from the students. This can be explained by a lack of experience and understanding of how working life is outside the university, particularly in relation to how foreign companies can provide experience for the enhancement of employment opportunities. Joint projects between industry and students are also perceived as an important vehicle for employability (mean=4.19). Activities can include a wide range of sub-activities such as students carrying out specific assignments from industry and student-facilitated arrangements, in which industry interacts with students outside the boundaries of the specific company.

The boundaries between an internship, schemes for practical training in firms and students carrying out assignments for the industry are blurred and difficult to distinguish. An internship might contain specific student assignments and vice versa. Hence, it might be relevant to label these activities and schemes as internships.

The significance of internships compared to other UIL activities corresponds with findings in previous studies (e.g. Vega-Jurado et al., 2008; Rabayah and Sartawi, 2008; Hansen and Lehman, 2006). Even so, it should be noted that the ability to actually realize the potential of internships rests on the assumption that these are formalized and attached to supervision from faculty and from the host organization in order to have the desired effect (Afonso et al., 2012; Ayarkwa et al., 2011).

*Internships with whom?*

Our findings correspond with prior studies in that various forms of internships are considered to be the most important UIL activity, especially when it directly improves employability. We have taken the assumption that the industry side of the UILs is MNEs and large joint ventures with local industry, which again welcome students into organized internship programmes. In this case, the main purpose is

to expose the students to a competitive environment that embraces internationally recognized tools, business processes, organizational structures and technology. In the end, the graduating student can improve attractiveness to local employers and improve the competitive power of the local industry. This implies that the UILs are primarily supplying competencies *from the firm to the student*.

But can UILs also include "weak" local firms competitive-wise as an internship actor? In other words, one can argue that the equation can be altered from a student adopting "global competencies" from the MNE to bringing their university-earned skills into improvement processes in local firms, and thus improve their employability. This *from student to firm* view is in line with McIlveen and Pansiero (2008), who emphasize the importance of engaging SMEs traditionally unfamiliar or unable to enter the graduate recruitment market, into UILs. For example, based on their existing theoretical and conceptual skills as a part of an internship scheme to improve the marketing function in a "weak" SME, a business student can introduce a formalized market analysis or help introduce computer software. These skills are based on international literature and textbooks applied in the curriculum. In accordance with this perspective, the UILs are supplying competencies from the student to the local firm, most frequently with SMEs.

This further implies that internship programmes as part of UILs should have two distinct different features in a resource-rich developing country. The UILs and internships can be illustrated in Figure 2:

*Figure 2: UIL internship modes*
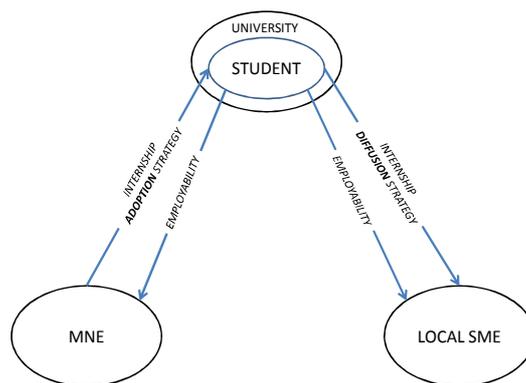


We propose that UILs in a developing country should include both internship *adoption strategies* and internship *diffusion strategies*. These strategies differ from where the origin of the skill transfer is located, either in the firm or in the university. Both strategies imply students being supported by mentoring arrangements in line with the studies of Rabayah and Sartawi (2008), Ayarkwa et al. (2011) and Afonso et al. (2012). We define the *internship adoption strategy* as "a student internship scheme in which the dominant feature is to adopt existing skills and attitudes from the firm to the student in order to improve employability". The *internship diffusion strategy* is defined as "a student internship scheme in which the dominant feature is to diffuse skills from the student to the local firm in order to improve the competitiveness of the firm and improve employability". The goal of the diffusion strategy is to also improve employability, and to improve the competitiveness of the local firm. By introducing both sets of internships, the university moves towards what Hansen and Lehman (2006) label "university as a development hub".

## Implications

Based on the perceptions of UIL activities within the context of a resource-rich developing country, four implications are suggested:

1. The university should stimulate UILs through organizational arrangements and targeted strategies to attract both MNEs and local businesses. Barriers identified in prior studies, such as e.g. Brimble and

Doner (2007), Vega-Jurado et al. (2008) and Hamdan et al. (2011), should be reduced. This further implies that the university should target the establishment of internships in the short run, and over time develop other sets of UIL mechanisms. The internships should cover both *adoption* (for the MNE) and *diffusion strategies* (for the local SME).

2. The MNEs - The MNEs should develop operational plans for the inclusion of students in internships as part of their local content compliance and "license to operate" in a broad sense. To establish a university liaison officer will help in reducing barriers towards university bureaucracy. Finally, activities should be prioritized over money. The local firm plays a primary role in an internship diffusion strategy, and should engage in student- or university-initiated internship proposals.

3. Through students organizations, students should establish relationships with local partner firms and offer practical assistance in subjects that can improve the local SME, for example to assist in developing business plans and budgeting.

4. Policy makers should expand the domain of *local content requirements* toward MNEs and other foreign firms to include contributions through UIL linkages, and hence improve the competitiveness of local firms and inclusion in an internationalized supply chain. Furthermore, universities should be required to present plans to reduce barriers between universities and the labour market, while still maintaining its ethos of fostering academic rigour and quality.

## Conclusion

This paper aimed at describing various types of activities within UILs, thereby suggesting the most relevant UIL activities in a developing country, based on the perspectives of both the university and the foreign company. The results indicate that the most effective UIL activities that enhance students' employability are student internships, joint student-industry projects and industry influence on modernizing curricula and programmes. It is suggested that internship programmes should be targeted toward two stakeholder groups in the industry, the foreign MNE and the local firms. Adoption and diffusion internship strategies are suggested for foreign companies and for local firms, respectively, as vehicles for increasing employability.

The findings should be interpreted with some caution, in the sense that the questionnaire addressing the employability effects of UIL activities does not clearly distinguish between employability in the foreign company versus employability in local SMEs. Furthermore, not all developing countries having rich natural resources hold a strategic position sufficient to motivate MNEs to invest in UILs. However, this weakness is considered as a minor point in the overall set of findings.

Starting with a rhetorical question, this study has indicated that UILs can help improve employability. By designing efficient and sustainable UIL activities, the potential gain from the country's natural resources can contribute to economic growth through employable human capital.

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**APPENDIX 1**

*UIL linkage activities*

| Modality group | Type of linkage activity | Description of linkage activity |
|---|---|---|
| Training and education | Cooperative education | Involving students spending a significant portion of their academic programme in private companies, student working experience programmes and student internships. |
| | Industrial training (continuing education) | Practical training of students and faculty on industry premises, with the purpose of understanding the application of new technologies and methods. |
| | Small business training | Collaboration in developing and operating a programme targeting small or nascent entrepreneurs or businesses, including short courses. |
| | Student assignments | Supporting master students with access to information sources during assignments and theses. Provisions to stimulate students to carry out university assignments/theses within the company. |
| | Visiting lectureships | Formal arrangements, in which private companies support staff to participate in teaching activities. Part-time teaching, industrial guest lecturers. |
| Services and consulting | Modernizing programmes | Assisting university in developing and modernizing curricula and programmes aligned with industrial needs. Industry participation in university boards and committees. |
| | Technology brokerage/licensing | Assistance in obtaining or licensing technologies and intellectual products from the university. |
| | Seminars and conferences | Collaboration in developing seminars, conferences and symposia with the purpose of enhancing the Tanzanian industrial base. |
| | Sabbatical | Facilitate faculty member's sabbatical in the industry, either in Tanzania or abroad. |
| | Direct or indirect investments | Through equity investments and venture capital schemes. |
| | Student recruitment | Participation in students arrangements, business presentations, recruitment events, etc. |
| | Coordination of technology-related issues | Through such inter-organizational entities such as regional technology councils. |
| | Industrial extension services | Including testing, calibration, repair services, production trouble-shooting and simple design modification. |
| | Business/consulting services | From business schools, or through research parks, science parks or incubators. |
| Research | Research consulting | Contractual research carried out for a private company with specified terms. |
| | Joint or cooperative research projects | Often carried out in dedicated laboratories, centres or institutes. |
| | Partnership contract | Long-term arrangement between a university and company to build up research facilities. |
| | Personnel interchange or industrial fellowships | On a regular or long-term basis to sustain interchange of research personnel. |
| | Shared equipment or facilities | Loan of equipment and facilities for university research use, on a regular or long-term basis. |
| Activity based sponsoring | Equipment donations | Laboratories, teaching equipment, etc. |
| | Endowment contributions | Sponsorship of prizes, awards and competitions to students and/or faculty. |
| | Financing professorial chairs | With relevance to local participation in the petroleum industry. |
| | Financing PhD candidates | Salaries and expenses. |
| | Financing master theses | Travel expenses and direct costs (not salaries). |
| | Financing foreign support | Support from foreign universities with the purpose of developing new programmes, or to improve alignment with petroleum-related industrial needs. |
| | Donations for university infrastructure | Endowments for buildings and grants for the purchase of equipment offered to the university. |
| | Financing stays abroad for students or faculty. | With the purpose of increasing the local industrial base (thus avoiding "brain-drain"). |

Source: Modified from Brimble and Doner (2007).

**TABLES**

*Table 1: Description of respondents*

| | | Student | | Company respondents | Faculty | | Sum | % of total |
|---|---|---|---|---|---|---|---|---|
| | | Respon-dents | Popu-lation | Respon-dents | Respon-dents | Popu-lation | Respon-dents | |
| Discipline background | Social sciences | 91 | 720 | 4 | 24 | 121 | 119 | 29.5 |
| | - *Courses*: Business Administration, Economics | | | | | | | |
| | Engineering/Natural Sciences | 144 | 320 | 65 | 76 | 82 | 285 | 70.5 |
| | - *Courses*: Mining Engineering, Mineral Processing Engineering, Geology and Engineering Geology, Environmental Science and Technology | | | | | | | |
| | Total | 235 | 1,040 | 69 | 100 | 203 | 404 | 100.0 |
| | Sample as % of population | | 22.60 | | | 49.26 | | |
| Gender | Male | 153 | | 61 | 6 | | 220 | 54.5 |
| | Female | 82 | | 8 | 94 | | 184 | 45.5 |
| | Total | 235 | | 69 | 100 | | 404 | 100.0 |
| Employment position | Professor/senior lecturer | N/A | | N/A | 29 | | | |
| | Lecturer/assistant lecturer | N/A | | N/A | 71 | | | |
| | Foreign expatriate | N/A | | 4 | N/A | | | |
| | Local | N/A | | 65 | N/A | | | |
| | Total | N/A | | 69 | 100 | | | |
| Sub-sector | Minerals | N/A | | 25 | N/A | | | |
| | Oil and gas | N/A | | 44 | N/A | | | |
| | Total | N/A | | 69 | N/A | | | |

*Table 2: Perceptions of UIL in training activities in increasing students' employability*

| Panel 1: Perceptions by status of respondents | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean (rank) by respondents | | | | Kruskal-Wallis test: Mean rank by status | | | Chi-Square | Asym Sig. |
| UIL activities | Students | Company | Faculty | All | Students | Company | Faculty | | |
| Student internships in companies | 3.987 (1) | 4.368 (2) | 4.640 (1) | 4.215 (1) | 172.04 | 214.51 | 259.3 | 48.105 | 0 |
| Practical training of students in industry premises | 3.983 (2) | 4.309 (3) | 4.540 (2) | 4.177 (2) | 178.1 | 209.78 | 250.64 | 32.941 | 0 |
| Practical support from industry to students during their master's theses | 3.589 (5) | 4.118 (6) | 4.088 (3) | 3.797 (5) | 171.26 | 233.8 | 228.41 | 29.834 | 0 |
| Industrial guest lecturers and part-time teachers from industry | 3.535 (6) | 4.203 (5) | 3.575 (6) | 3.661 (6) | 182.76 | 258.86 | 190.94 | 26.852 | 0 |
| Industrially experienced lecturers | 3.914 (3) | 4.304 (4) | 3.866 (5) | 3.970 (3) | 191.51 | 238.55 | 190.83 | 11.025 | 0.004 |
| Short courses for small businesses and entrepreneurs | 3.710 (4) | 4.391 (1) | 3.958 (4) | 3.889 (4) | 174.58 | 264.17 | 208.84 | 39.175 | 0 |
| N | 233 | 68 | 100 | 401 | 233 | 68 | 100 | | |

| Panel 2: Perceptions by discipline background of respondents | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| UIL activities | Mean (rank) by discipline background | | Mann-Whitney U–test Mean rank by discipline background | | | | | |
| | Social Science | Engineer-ing, Natural and Applied Science | Social science | | Engineering, Natural and Applied Science | | Mann-Whitney U-test | Asymp. Sig. (2-tailed) |
| | | | Mean rank | Sum of ranks | Mean rank | Sum of ranks | | |
| Student internships in companies | 4.237 (1) | 4.213 (1) | 209.55 | 24726.50 | 196.71 | 55473.50 | 15570.500 | .271 |
| Practical training of students in industry premises | 4.160 (2) | 4.191 (2) | 206.13 | 24529.50 | 198.84 | 56071.50 | 16168.500 | .530 |
| Practical support from industry to students during their master's theses | 3.896 (5) | 3.759 (5) | 208.16 | 23938.50 | 189.48 | 51916.50 | 14241.500 | .111 |
| Industrial guest lecturers and part-time teachers from industry | 3.733 (6) | 3.637 (6) | 207.15 | 24029.00 | 193.47 | 53786.00 | 15005.000 | .251 |
| Industrially experienced lecturers | 4.094 (3) | 3.918 (3) | 217.56 | 25455.00 | 191.24 | 53548.00 | 14208.000 | .026 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Short courses for small businesses and entrepreneurs | 3.847 (4) | 3.906 (4) | 198.19 | 23386.00 | 197.92 | 54824.00 | 16321.000 | | .982 |
| N | | 119 | 282 | 119 | | 282 | | | |

*Table 3: Perceptions of UIL in consultancy services' activities on increasing students' employability*

Panel 1: Perceptions by status of respondents

| | Mean (rank) by respondent status | | | | Kruskal-Wallis test: Mean rank by status | | | Chi-Square | Asym Sig. |
|---|---|---|---|---|---|---|---|---|---|
| UIL activities | Students | Company | Faculty | Total | Students | Company | Faculty | | |
| Industry assistance in modernizing and developing university curricula and programmes | 3.97 (2) | 4.38 (2) | 4.37 (2) | 4.13 (2) | 174.35 | 232.54 | 234.63 | 31.935 | 0 |
| Sabbatical arrangements, in which university teachers spend time in the local industry or abroad | 3.82 (4) | 4.19 (5) | 3.36 (5) | 3.77 (5) | 204.22 | 250.85 | 150.64 | 36.844 | 0 |
| Lecturers engaged in university-industry consultancy projects | 3.74 (5) | 4.26 (4) | 3.84 (4) | 3.85 (4) | 183.16 | 256.06 | 195.91 | 24.258 | 0 |
| Seminars and conferences arranged jointly by faculty and industry | 3.93 (3) | 4.30 (3) | 4.11 (3) | 4.03 (3) | 187.51 | 237.39 | 208.68 | 12.039 | 0.002 |
| Joint projects between students and industry | 4.00 (1) | 4.47 (1) | 4.43 (1) | 4.19 (1) | 175.95 | 241.26 | 236.52 | 32.791 | 0 |
| N | 234 | 68 | 99 | 401 | 234 | 68 | 99 | | |

Panel 2: Perceptions by discipline background of respondents

| UIL activities | Mean (rank) by discipline background | | Mann-Whitney U–test Mean rank by discipline background | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Social Science | Engineering, Natural and Applied Science | Social science | | Engineering, Natural and Applied Science | | Mann-Whitney U-test | Asymp. Sig. (2-tailed) |
| | | | Mean rank | Sum of ranks | Mean rank | Sum of ranks | | |
| Industry assistance in modernizing and developing university curricula and programmes | 4.129 (3) | 4.136 (2) | 198.52 | 23028.00 | 197.78 | 55182.00 | 16122.000 | .948 |
| Sabbatical arrangements, in which university teachers spend time in the local industry or abroad | 3.922 (4) | 3.712 (5) | 220.73 | 25383.50 | 189.40 | 53222.50 | 13601.500 | .007 |
| Lecturers engaged in university-industry consultancy projects | 3.853 (5) | 3.846 (4) | 203.04 | 23552.50 | 195.91 | 54657.50 | 15597.500 | .542 |
| Seminars and conferences arranged jointly by faculty and industry | 4.227 (2) | 3.961 (3) | 229.86 | 27353.00 | 188.07 | 52847.00 | 13226.000 | .000 |
| Joint projects between students and industry | 4.319 (1) | 4.138 (1) | 220.38 | 26225.00 | 193.56 | 54778.00 | 14592.000 | .023 |
| N | 119 | 282 | 119 | | 282 | | | |

*Table 4: Perceptions of UIL in research activities in increasing employability*

Panel 1: Perceptions by status of respondents

| | Mean (rank) by respondents | | | | Kruskal-Wallis test: Mean rank by status | | | Chi-Square | Asym Sig. |
|---|---|---|---|---|---|---|---|---|---|
| UIL activities | Students | Company | Faculty | Total | Students | Company | Faculty | | |
| Sharing of specialized equipment or research facilities between industry and university | 3.74 (2) | 4.15 (2) | 3.92 (2) | 3.85 (2) | 185.81 | 234.32 | 202.27 | 10.977 | 0.004 |
| Joint industry-university research | 3.86 (1) | 4.32 (1) | 4.08 (1) | 3.99 (1) | 182.15 | 246.43 | 212.41 | 21.846 | 0 |

| N | 233 | 69 | 99 | 401 | 233 | 69 | 99 | | |
|---|---|---|---|---|---|---|---|---|---|
| *Panel 2: Perceptions by discipline background of respondents* | | | | | | | | | |

| UIL activities | Mean (rank) by discipline background | | Mann-Whitney U–test Mean rank by discipline background | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Social Science | Engineering, Natural and Applied Science | Social Science | | Engineering, Natural and Applied Science | | Mann-Whitney U-test | Asymp. Sig. (2-tailed) | |
| | | | Mean rank | Sum of ranks | Mean rank | Sum of ranks | | | |
| Sharing of specialized equipment or research facilities between industry and university | 3.769 (2) | 3.884 (2) | 193.29 | 22615.00 | 199.28 | 55200.00 | 15712.000 | .607 | |
| Joint industry-university research | 4.102 (1) | 3.950 (1) | 215.08 | 25380.00 | 193.67 | 54420.00 | 14799.000 | .061 | |
| N | 119 | 282 | 119 | | 282 | | | | |

## APPENDIX 2

### QUESTIONNAIRE

### ROLE OF UNIVERSITY-INDUSTRY LINKAGES IN ENHANCING STUDENTS' EMPLOYABILITY AND INNOVATION

**Part I: Profile of the respondent**

1. Name of the respondent (optional) _____; Contacts (e-mail/tel.) _____

2. Gender (tick √ any of the following): a) Male _____; b) Female _____

3. Status of the respondent: (tick √ any of the following)
   a) Student _____ (if **a** proceed with question 4 in Part I, and the rest in the following Parts )
   b) Lecturer _____ (if **b** proceed with questions 5 & 6 in Part I, and the rest in the following Parts)
   c) Employee from the extractive company_____(if **c** proceed with questions 6 to 9 in Part I, and the rest in the following Parts)

4. College/school (tick √ any of the following)and mention the programme you are involved in
   a) College of Social Science _____, Programme/Department _____
   b) University of Dar es Salaam Business School _____, Programme/Department_____
   c) College of Engineering and Technology _____, Programme/Department _____
   d) College of Natural and Applied Science _____, Programme/Department _____
   e) College of
   f) _____

5. Employment position (tick √ any of the following)
   a) Professor/Senior Lecturer _____
   b) Lecturer/Assistant Lecturer _____

6. Education background and area of work (tick √ any of the following)
   a) Social Science (Business Administration, Economics) _____;
   b) Engineering/Technology, Applied and Natural Science, Environment _____

7. Status of employment (employees from companies) (tick √ any of the following)
   a) Foreign expatriate _____
   b) Local _____

8. Please indicate the sub-sector which the company where you are working is involved in  (tick √ any of the following)
   a) Minerals _____
   b) Oil _____
   c) Gas _____

9. Please indicate the type of activities conducted by the company where you are working  (tick √ any of the following)
   a) Exploration of natural resources _____
   b) Exploitation of natural resources _____

**Part II: Education and Training**

Please indicate your perception regarding the influence of university-industry (extractive company) collaboration in the area of training on employability of students and innovation by putting a tick (√) in the table below. Please note 5 = strongly agree; 4=agree; 3=neutral; 2= less disagree; 1 = strongly disagree; 0 = don't know

| | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|
| A1. Student internships in companies increase the *employability of the student.* | | | | | | |
| A2. Practical training of students in industry premises to be exposed to practical working conditions improves the *employability.* | | | | | | |
| A3. Student internships in companies increase *innovation* in the companies. | | | | | | |
| A4. Practical support from industry to students during their master's theses improves the *employability of students*. | | | | | | |
| A5. Company collaboration with students during their work with their master's thesis improves *innovation in the company*. | | | | | | |
| A6. Industrial guest lecturers and part time-teachers from industry improve *the employability of students*. | | | | | | |
| A7. Part time-lecturers from industry teaching at a university improve *innovation* in their company. | | | | | | |
| A8. Industrial experienced lecturers have a positive effect on *student employability*. | | | | | | |
| A9. Collaboration between university and industry in arranging short courses for small businesses and entrepreneurs improves *innovation among local companies*. | | | | | | |
| A10. Collaboration between university and industry in arranging short courses for small businesses and entrepreneurs improves employability among regular students. | | | | | | |
| A11. Limited collaboration between university and industry in the area of training for local firms hampers their *innovation*. | | | | | | |
| A12. Industry-university collaboration in training increases *innovation*. | | | | | | |

**Part III: Services and Consulting (S)**

Please indicate your perception regarding the influence of university-industry (extractive company) collaboration in the area of Services and Consulting (S) on employability of students and innovation by putting a tick (√) in the table below. Please note 5 = strongly agree; 4=agree; 3=neutral; 2= less disagree; 1 = strongly disagree; 0 = don't know

| | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|
| A14. Industry assistance in modernizing and developing university curriculum and programmes in line with industrial needs increases *student employability*. | | | | | | |
| A815. Sabbatical arrangements in which university teachers spend time in the local industry or abroad have a positive effect on *student employability*. | | | | | | |
| A16. Sabbatical arrangements in which university teachers spend time in the local industry or abroad have a positive effect on *innovation* in the host company. | | | | | | |
| A17. Lecturers engaged in university-industry consultancy projects improve *student employability*. | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| A18. Industry assistance in modernizing and developing university curriculum and programmes in line with industrial needs will increase *innovation*. | | | | | | |
| A19. Seminars and conferences arranged by university and industry have a positive effect on *innovation.* | | | | | | |
| A20. Lecturer's doing consulting for industry has a positive effect on *innovation.* | | | | | | |
| A21. Seminars and conferences arranged jointly by faculty and industry have a positive effect on *student employability.* | | | | | | |
| A22. Joint projects between students and industry (for example recruitment events) have a positive effect on student employability. | | | | | | |
| A23. Joint projects between students and industry have a positive effect on innovation. | | | | | | |

**Part IV: Research Activities (R)**

Please indicate your perception regarding the influence of university-industry (extractive company) collaboration in the area of Research Activities on the employability of students and innovation by putting a tick (√) in the table below. Please note 5 = strongly agree; 4=agree; 3=neutral; 2= less disagree; 1 = strongly disagree; 0 = don't know

| | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|
| A24. Research carried out for local companies by faculty members improves *innovation.* | | | | | | |
| A25. Joint or cooperative research projects with industry improve *innovation.* | | | | | | |
| A26. Interchange of personnel between industry and university improves *innovation* (for example, faculty member works in industry for a year and industry employee works one year in university). | | | | | | |
| A27. Sharing of specialized equipment or research facilities between industry and industry improves *innovation*. | | | | | | |
| A28. Sharing of specialized equipment or research facilities between industry and industry improves student employability. | | | | | | |
| A29. Joint industry-university research increases *innovation among local firms.* | | | | | | |
| A30. Joint industry-university research increases student employability. | | | | | | |