Contents

The Challenges and Prospects of ICTs in Teaching and Learning in Sunyani Polytechnic, Ghana: ................................................................. 12

Sustainability of TVET: Analyzing the Critical Choice Factors .................. 18

Development of a Mobile Juicer with Cooling System for Retailing Fresh Fruit Products .......................................................... 28

Sustainable Growth through Development of Small and Medium Enterprises Linked to Tertiary Institutions in the Republic of Tanzania ................. 39

Modeling the Impact of Knowledge and Technology Transfer between TVET institutions and Industries ................................................ 47

Students Motivation and Preference of Studying Hospitality and Tourism Management Programmes in Polytechnics: A Case Study Ho Polytechnic ................. 60

Streamlining TVET System for Entrepreneurship Development: the case of the Transport Industry in Tanzania .................................................................... 71
Promotion of Indigenous Dehydration Technology in Reducing Postharvest Losses for Sustainable Development:

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ABSTRACT

Postharvest losses has been a major concern to most African governments given that during bumper harvest in Africa, food crops are transported from farming communities in rural areas to urban centres for sale. However, a lot of produce is left unsold and is thrown away. This loss can be minimized if urban dwellers dry and preserve the food crops for use in the lean season. Sun drying is cheap and easy but the product runs the risk of being contaminated by dust, animals, and germs. Most solar dryers are usually bulky and take up a lot of space. This study was based on design and construction of two drying and food preservation equipment. A Tent Solar Dryer was designed and constructed. The design was foldable with fixed foldable drying trays. The dryer was made of a wooden box that was constructed from ¼ inch plywood. The heating element consisted of nine incandescent 100 watt bulbs and a fan at the base was used to circulate the warm air. The solar dryer and dehydrator were used separately for the production of dry convenience food items such as tomato powder, very ripe plantain flour, and kose (fried cowpea fritters) flour, for the preparation of tomato sauce, tatale (fried plantain fritters), and kose respectively. The equipment was found to be portable, cheap and easy to use, and the products hygienic. The results showed that postharvest in urban areas losses could be minimized by using simple drying equipment to dry preserve food.

Key words: Postharvest, Losses, Solar, Dryer, Food, Preservation,

INTRODUCTION

Food processing is employed principally to prevent the spoilage of food during storage, throughout distribution, retailing and use by the consumer (Arthey and Dennis, 1991). Most modern methods of preservation such as canning, chemical preservation and refrigeration are too expensive, inaccessible and too technical, especially in developing countries. A more feasible, simple, cheap and accessible alternative is therefore necessary (Fellows and Hampton, 1992). The question is what can be done to help the urban dwellers, especially in developing countries, to take advantage of bumper harvest times is to buy and store as much food produce as possible so as to make it available for use during lean seasons. Dried food is easy to store because of the reduced size and weight; it
requires no refrigeration and does not attract insects if properly dried (Morris, 1952). About twenty percent (20%) to fifty percent (50%) of the fruits, vegetables, tubers and root crops and about twenty percent (20%) to thirty percent (30%) of cereals and legumes would be lost in postharvest; this is a major cause of food insecurity in the country (Food Security Ghana, 2013). The consequences of spoilage are compositional changes, nutritional losses and contamination of the produce. Food spoilage also has a large impact on the economy because the government has to spend so much money to import food products to fill the deficit created as a result of post-harvest losses. During bumper harvest in Africa, food crops are transported from farming centres in rural areas to urban centres for sale. This creates a lot of challenges since the produce must either be stored, processed, given away, or be disposed of. Sun drying is the oldest known method of food preservation (Hui et al., 2010). Sun drying is an effective method of food preservation which also has the advantage of being simple and a traditionally-understood technology with little or no equipment cost (Fellows and Hampton, 1993). The simplest method of drying is to lay the produce in the open air, either on mats or on raised platforms. Although this is effective there is limited control over the drying process which results in a variable product quality and a greater risk of contamination. To give more control over these aspects, solar dryers have been designed which protect the produce from dirt and insect and increase the rate of drying.

Solar drying is a modification of sun drying. The sun rays are collected inside a specially designed unit with ventilation for removal of moist air. The temperature in the unit is usually 20 to 30°C higher than in open sunlight resulting in shorter drying times. While solar drying has many advantages over sun drying, lack of control over the weather is the main problem with both methods (Hui et al., 2010). The Solar tent dryer is made up of a polythene sheet over a wooden frame. It works through evaporative drying. When set up in the sun, solar energy passes through the transparent polythene but gets trapped within it thereby raising the internal temperature. Cool air flowing in through an opening gets heated up and moves out moisture from food laid on rack in the dryer (Olokor and Omojowo, 2009). However, solar dryers are bulky, and take up space because they need to be permanently located outside the house even at night. The use of solar dryers can be made easier for urban dwellers if they are designed to be easily movable and take up less space.

Oven drying, on the other hand, is the most practical way to dehydrate food. It requires little initial investment, protects food from insects and dust and does not depend on the weather. Continual use of an oven for drying is not recommended because energy costs tend to be high. Also it is difficult to maintain a low drying temperature in the oven and foods are more susceptible to scoraching at the end of the drying period (Sudheer and Indira, 2007). A dehydrator is a better alternative to the oven because ovens are less energy efficient than dehydrators (Sudheer and Indira, 2007). Ameko et al., (2013) constructed a Portable Wooden Box Electric Dehydrator (PWBED) from ¼ inch plywood, heated by nine incandescent 100 watt bulbs and the warm air circulated by a CPU fan at the base, and compared the drying
performance to that of a conventional laboratory oven. The cost of electrical energy input to the PWBED was 48.0% that of the oven.

The aim of this study was to design and construct two foldable direct tent solar dryers; construct a PWBED; and use the equipment to produce three types of dry convenience food items (very ripe plantain flour, Kose flour, and tomato Powder) as a means of reducing postharvest losses.

MATERIALS AND METHODS

The design and construction of a Foldable Tent Solar Dryer with Removable Trays (TSD – RT) was modification of the conventional direct solar dryer in that it was made foldable so as to improve its mobility. This was achieved by replacing the base with a black fabric so that the dryer could be folded and transported easily.

Figure 1 shows the dimensions and structure of the equipment.

Figure 1: Dimensions of the solar dryer
The TSD – RT was modified into a Foldable Tent Solar Dryer with Fixed Foldable Drying Trays (TSD – FFT). This was achieved by removing the wooden supports from the shorter ends so that the trays would also fold whenever the dryer was folded (Fig. 3a & b). This enabled the dryer to be folded and transported easily without removing the food. The two dryers were set-up side by side and were used from sunrise to sunset to dry the food items.
The Portable Wooden Box Electric Dehydrator (PWBED) was constructed according to the method of Ameko et al. (2013). Figure 5a-f shows the construction of the PWBED.

Figure 5A-C: Construction of PWBED; D &F: Completed PWBED; F: PWBED in use.

Processing of fresh food items into dry convenient food items
Navrongo Tomato Powder

A crate of fresh ripe tomatoes, locally known as “Navrongo” was bought from the Tudu Market in Accra, Ghana. The tomatoes were pre-processed according to the method described by the FAO and INPhO (1998) for home-processing of fresh tomatoes into dried tomatoes.

This involved washing and slicing the tomatoes, and then blanching the slices in boiling water containing preservative (citric acid powder).

The treated slices were divided into four equal portions by weight. One portion was dried in the TSD - RT, another portion in the TSD - FFT and the last portion in the PWBED at a temperature of 95ºC. The dried slices were milled into powder with the aid of a stainless steel Kenwood Chef Warring Blender.

The last portion of tomato slices served as the control. This portion was not blanched and was not dried. The fresh slices were milled into a paste and stored at 4ºC in the refrigerator for later use.

Very Ripe Apem Plantain Flour

Very ripe “Apem” plantain was purchased from the Makola Market in Accra, Ghana. The pre-treatment of very ripe “Apem” plantain prior to processing into flour was done by the method of Zakpaa et al. (2010). This involved washing and peeling of the ripe plantain fruits, and cutting them into thin slices approximately 2 mm thick. The slices were divided into two equal portions by weight. One portion was treated with 2% (w/v) Sodium thiosulphate solution.

The treated slices were divided into four equal portions by weight. One portion was dried in the TSD - RT, another portion in the TSD – FFT and the last portion in the PWBED at a temperature of 60ºC. The weights of the drying slices were checked every hour until a constant weight was obtained. This was done for the slices in each of the drying equipment. The dried plantain chips were milled into flour with the aid of a stainless steel Kenwood Chef Warring Blender.

The last portion of plantain slices served as the control. This portion was not treated with the Sodium thiosulphate solution and was not dried. The fresh slices were milled into a rough paste and stored at 4ºC in the refrigerator for later use.

Niger Kose Flour

Black eye cowpea (Vignaunguiculata) was purchased from the Makola Market in Accra, Ghana. The variety purchased is locally known as “Niger”. The “Niger” was purchased and used based on the recommendation of some “Kose” vendors and legume traders.

Whole grains were sorted to remove stones and debris and then soaked in warm water for three hours to loosen the hulls from around the endosperm. The hulls were separated from the endosperm by flotation in water and poured away. The endosperms were washed clean with water. The endosperms were milled into paste at the traditional mill.

The paste was divided into four equal portions by weight. One portion was dried in the TSD - RT, another portion in the TSD - FFT and the last portion in the PWBED at a temperature of 105ºC. The dried paste was milled into flour with the aid of a stainless steel Kenwood Chef
Warring Blender. The last portion of paste served as the control. This portion was stored at 4°C in the refrigerator for later use.

RESULTS

Drying temperatures

The average temperature in the STD – FFT over the three period days was 36.5°C compared to 35.4°C in the STD – RT (Figure 6). The maximum temperature of the PWBED was 130°C.

The maximum temperature recorded for STD – FFT over the period was 49°C and the STD – RT was 49°C which were obtained during very clear day of sunny skies (Figure 6).

![Figure 6: Air temperature changes in the solar dryers during drying of tomatoes](image)

It took the STD - FFT and the STD – RT three days to complete the drying process of the tomato slices. At the end of processing, 100g of fresh tomatoes dried in the STD - FFT produced 4.2% of dry product while the STD - RT gave 4.5% of dry product. It took the PWBED seven hours to dry the product to 4.1% dry weight (Figures 7 and 8).

The STD – RT tomato powder had higher microbial load of 7.8 x 10^5 cfu/g than the STD - FFT powder which had 7.8 x 10^5 cfu/g due to exposure of its products during drying.
Figure 7: Percentage Moisture loss of the tomato slices during the drying process

Figure 8: Percentage of residual weight of the tomato slices during the solar drying process
Figure 9: Sensory scores of sauces prepared from fresh tomatoes and tomato powder from the PWBED

Generally, the testers preferred Tatale obtained from the paste of the fresh ripe plantain (Figure 10).

Figure 10: Sensory scores of Tatale prepared from fresh plantain paste and plantain flour from the PWBED

The results indicated that the freshly prepared Kose paste was generally preferred over the Kose from the flour (Figure 11).
DISCUSSION AND CONCLUSIONS

The drying temperatures in the solar dryers were lower in the morning, peaked in the afternoon and then dropped during late afternoon whilst the temperature in the PWBED was constant at 95°C throughout the drying period. The STD - RT tomato powder had higher microbial load of $7.8 \times 10^5$ cfu/g than the STD - FFT powder which had $7.8 \times 10^5$ cfu/g due to exposure of its products during drying.

Some of the reasons testers preferred fresh ripe plantain Tatale obtained from the paste of the fresh ripe plantain were that it had a natural taste, colour, texture and smell than the Tatale from the flour. In view of the socio-economic status of the people (mostly women) of Africa who are involved in small scale horticultural enterprises, any suggested improvements to the traditional systems of drying should be simple and cheap. This should make use of locally available materials and utilize local craftsmen, ingenuity and skill. Genuine efforts should be made to take into account the traditional practices prevalent in different cultures and incorporate them into improved technologies such as the use of improved solar tents and dehydrators for drying of products wherever possible.

The two foldable solar dryers and PWBED were very effective in dry preserving farm produce that have very short shelf life such as tomatoes. This research has proved that ripe plantain, fresh tomatoes and Kose paste can be dry processed into flour and can be preserved.

The plantain flour can also be used for thickening soups, stews, sauces and also for preparation of biscuits, chips bread and porridge.
REFERENCES


Food and Agriculture Organization of the United Nations (FAO) and the Information Network on Post-Harvest Operations (INPhO).(1998). Three home-processing and preservation techniques.

The Challenges and Prospects of ICTs in Teaching and Learning in Sunyani Polytechnic, Ghana:

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ABSTRACT

Globally, the impact of Information and Communication Technology (ICT) in the past decades has been enormous. ICT plays a crucial role in socio-economic development and in bringing the world together as a global village. Indeed, in today’s knowledge based economy, a completely new set of skills are required. Developing countries need to respond to demand for strategies to prepare the youth for the competitive opportunities driven by information and communication technology. The role of ICT tools in education should be more emphasized despite the heavy investment on ICT infrastructure, equipment and professional development for improved education. However, the adoption of ICT and its integration in teaching and learning have met challenges. This study reports the state of ICT usage in teaching and learning at Sunyani Polytechnic, Ghana. The study highlights factors that influence effective integration of ICT in teaching and learning. The findings revealed minimal adoption of ICT in teaching and learning at Sunyani Polytechnic, Ghana. The study makes recommendations that would enhance ICT uptake and adoption when implemented.

Keywords: Information, Communication, Technology, Learning, Tertiary, Institution

INTRODUCTION

Both developed and developing countries are undertaking a key vital task of streamlining their education and training systems to meet the development requirements in the context of changing environment (Yamba, 2012). In this 21st century, technical education institutions are expected to produce a new class of competent workforce who can compete and excel in a speedily changing environment and improve the country’s economy. In the past two decades Information and Communication Technology (ICT) has had a tremendous impact (Oliver, 2001). The power of ICT has brought a tremendous change to various aspects of people’s lives. As technology keeps on changing speedily, it requires a new set of mind to emerge as cost effective, powerful technology; its great potential continues to surface in education. Thus, a totally new set of skills is required in this 21st century of globalization in information and technology (Hawkins, 2002). The role of ICT in education should be more stressed in strategic polices of developing countries to train their youth to contend in this informative, knowledge and technological era.

Hence ICT can be used to build up student’s ability to produce solutions in their learning, communication and cooperation (Plomp et al., 1996; Voogt, 2003). For African countries to significantly trim down the gaps of knowledge, technology and economy with the developed countries, the development
and application of ICT in the continent’s higher institutions of learning is very essential (Kofi, 2007). Whereas computers and technology are common (Cuban, 2001), developing countries are not enjoying their benefits due to certain obstacles. These obstacles include inadequate financial support for purchasing of the technology, lack of training for teaching practitioners and inadequate motivation for teachers to adopt ICT as teaching tools (Starr, 2001). The Ghananian government is planning the use of ICT as a major contributor in the country’s economic development (Dadzie et al., 2012). The Education Strategic Plan 2003-2015 and Ghana Poverty Reduction Strategy Paper pointed out that ICT is a way of drawing out to the poor in the country. In 2004, the cabinet approved the National ICT for Accelerated Development (ICT4AD) Policy to improve the socio-economic development, information society, and cultural well-being; through the accelerated development and infrastructure modernization of the economy and society. The Government is using ICT as the main engine for accelerated and sustainable economic and social development. The main objective of the ICT4AD policy is to transform Ghana into a middle income, information-rich, knowledge based and technology-drive high-income economy and society. One of the significant parts of the ICT4AD policy is the incorporation of ICT at all levels of education.

Out of this policy an ICT in education framework document was produced to integrate ICTs in schools by Ministry of Education, Science and Sports (Kofi, 2007). However, it is worth pointing out that the integration period for ICT in education policy in schools is a long term development. ICT policy is not predominantly integrated in the tertiary sector and therefore plans are implemented with stakeholders and Ministry or with other partners. Lately, there have been efforts and resources aimed at improving teachers’ skills in ICT for teaching and learning (Magambo, 2007).

ICT implementation has been reviewed by researchers in many ways. For example, a study on the diffusion of information communication technology in selected Ghanaian Senior Secondary Schools by Malcolm and Godwyll (2008); while Peansupap (2005) examined factors facilitating ICT dispersion in Australian construction organizations. The factors affecting application of ICT in distance education has been reported by Salih (2004). Bagchi and Udo (2007) made observations on the empirical test factors that drive ICT adoption in Africa and other sets of nations. In addition, Alema and Sam (2006) analyzed the critical issues bedeviling ICT penetration in the rural areas of Ghana. Amekuedee (2002) also explored the use of ICT in teaching and learning. Hinson and Amidu (2006) investigated the adoption rate of internet by final year students in Ghana's oldest business school. Nsiah and Samuel (2007) on one hand examined the Development and Exploitation of ICT in Technical. Vocational Education and Training (TVET) for Socio-Economic Development in Ghana. In a related study, Agyepong (2007) assessed the missing link in the application of ICT in meeting the training needs of students of Sunyani Polytechnic, Ghana. On the other hand, whereas there is wide spread number of ICTs and knowledge adoption in institutions of higher learning in Ghana, there’s little information on how ICT adoption is impacting on delivery of training among students. This paper endeavored to address this, with Sunyani Polytechnic as a case study.

**MATERIALS AND METHODS**

The study employed a descriptive and
exploratory research design whose focus was use of ICT in teaching and learning at Sunyani Polytechnic. In addition, a qualitative approach was deployed to provide a realistic feel of the parameters surveyed through interviews and observation. The study was carried out in Sunyani Polytechnic in the Brong Ahafo region of Ghana, and targeted a sample of 120 teaching staff out of 200. These were drawn from the Schools of Business, Engineering and Applied Sciences. A self administered survey questionnaire, observation check list and documentary review guide designed for data collection were used. The questions were close-ended with a few open ended to allow respondents free expression. Observational data was coded to correspond with the percentages. Quantitative data was organized in prearranged multiple answers as described by Creswell (2003). The data was analyzed using Statistical Package for Social Sciences (SPSS, Version 18) and Microsoft Excel (Microsoft, 2010). Prior to the analysis of the collected data, the questionnaires were checked for consistency of responses. The outputs were summarized and presented as means in charts, bar-graphs, frequencies and cross tabulations.

RESULTS

The School of Business reported the highest users of ICT in teaching and learning at 54% while Engineering recorded the least (22%) (Table 1). Distribution of ICT users based on gender indicated that males dominated at 91% while females accounted for a paltry 9% (Figure 1). Analysis of the role of age in adoption level indicated that lecturers aged between 31 and 40 years were the majority users at 51%, while those aged 21 - 30 and 41 – 50 years were at par at 20% (Figure 1). On the basis of training levels, the majority (49%) of staff who had adopted ICT usage were trained up to Masters degree level, followed by Bachelors degree holders at 34%, while Doctorate degree holders were the least at 4% (Fig. 2). An endeavour to find out how ICT skills are acquired revealed that most respondents (51%) learnt on their own while those taught by friends accounted for 40% (Figure 3).

Table1: Distribution by Schools of teachers Using ICT in Teaching and learning at Sunyani Polytechnic, Ghana (2012)

<table>
<thead>
<tr>
<th>School</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>School of Business</td>
<td>54 (65*)</td>
</tr>
<tr>
<td>School of Engineering</td>
<td>22 (26*)</td>
</tr>
<tr>
<td>School of Applied Sciences</td>
<td>24(29*)</td>
</tr>
<tr>
<td>Total</td>
<td>100 (120*)</td>
</tr>
</tbody>
</table>

* Indicates frequencies
Figure 1: Age ranges of teachers using ICT for Teaching and Learning at Sunyani Polytechnic, Ghana (2012)

Figure 2: Academic level of teaching Staff Using ICT for Teaching and Training at Sunyani Polytechnic, Ghana (2012)

Figure 3: Source of ICT Skills acquired by teaching Staff Using ICT for Teaching and Training at Sunyani Polytechnic, Ghana (2012)
The study also revealed that a few of the lecturers were able to use computers in teaching while majority of the lecturers were still comfortable using traditional ways of teaching (chalk and blackboard and handouts dictating notes). In addition, computers were not many, hence not accessible to every lecturer for use in preparing lessons. Furthermore, the computers in the computer laboratories were so few that teaching was done in shifts. However, apart from computer laboratories, some of the lecture rooms had a Desk Top computer and an over-head projector. It was observed about three (3) students shared one computer for academic work in the computer laboratory. Furthermore, the time-table for ICT-related courses were occasionally ran in shifts.

**DISCUSSION AND CONCLUSIONS**

The information generated highlights the current state of ICT usage in teaching and learning in Sunyani Polytechnic, Ghana. The study indicated that computer adoption for teaching in the institution is mainly focused on ICT related courses, thus leaving other courses to be taught using traditional methods. Lack of computers and access to computers were a barrier to adoption of ICT as a teaching aid. Several studies have been carried out on Information and Communication Technology in institutions of higher learning in Ghana. The factors influencing effective integration of ICTs in teaching and learning at Sunyani have been analyses and described. The factors contributing towards the lack of ICT infrastructural development, alongside high cost of training materials, are the major contributors of poor ICT adoption in teaching and learning. These findings are supported by studies conducted by Malcolm and Godwyll (2008). Some studies have reported poor ICT competency skills as contributors to poor adoption levels (Mooij and Smeets, 2001). The study revealed that the level of ICT implementation in teaching and learning in Ghana is still very low, just as in many other African countries.

This study indicated that introduction of ICTs in teaching and learning process could create significant changes in both teaching and learning. ICT also plays a crucial role in socio-economic development. Indeed, in today’s knowledge based economy, a completely new set of skills are required. TVET institutions have a critical role to play towards the achievement of requisite computer literacy levels.

**REFERENCES**


Amekuedee JO (2002) Information Communication Technology (ICT) for Teaching and Learning. *Paper presented at Biennial Seminar of Committee of University Librarians and their Deputies (CULD) at the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana*. The University Press, KNUST. 13-14,
Bagchi K and Godwin O (2007) Factors that affect the adoption of information and communication technology in Africa and OECD set of nations. *University of Texas*, 3:2,13 - 17.


Peansup A and Walker R (2012). Factors enabling information and communication technology diffusion and actual implementation in construction organizations, Australia.

Sustainability of TVET: Analyzing the Critical Choice Factors

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ABSTRACT

Sustainability of the Technical and Vocational Education Training (TVET) programme is fundamental in nation building, especially in developing and emerging economies. This study reviews government policies on the TVET programme and how the implementation of such policies influences the choice preference of students at the basic, secondary and tertiary levels. Consequently, the key factors that affect choice of a TVET career from the foundation stage of education through to the professional levels are examined. The challenges of the government policies are assessed in the light of promoting TVET. Various educational policies relating to technical and vocational training and other similar interventions formed the secondary data for the study. The entire sample for the study included the students from the three levels of the education hierarchy, as well as policy implementers (technocrats) were interviewed and answered questionnaires. The study revealed that actual provision of infrastructure and facilities in institutions, increased government commitment in fund provision and tailor-making the curricular to suit industry needs were prominent in ensuring that TVET programmes were among preferred study courses for students. On the contrary, educational managers focus on the commerce programmes. Lack of effective working legislature, inadequate professionals in the classrooms and parental preference for “white collar” professions hampered the sustainability of TVET choices. The study concludes that a more practical approach by governments and proper stakeholder considerations be inculcated into any policy geared towards the total development of the TVET programme.

Key words: Sustainability, Preference, Policy, Legislature, Stakeholders

INTRODUCTION

The establishment of the Castle Schools by the British Colonial Administration, which later brought in its wake the Missionary Schools in 1830s and 1850s, marked the commencement of formal education in the Gold Coast, present day Ghana. This journey has ever since its inception gone through its own period of metamorphosis. The pre-independence era witnessed the establishment of technical institutes to train the needed technicians and technologists for the accelerated development of the country (Nyarko, 2011). Career selection remains one of many important choices students make in determining their occupational path and defines their personalities and interests. This is usually characterized by several consideration and evaluations as it has the tendency to make the individual successful or otherwise.

In West Africa in particular, traditional apprenticeship offers the largest opportunity for the acquisition of employable skills in the informal sector. In
Ghana, the informal sector accounts for more than 90 percent of all skills training in the country. In all of Sub-Saharan Africa, formal TVET programmes are school-based. In some countries, training models follow those of the colonial power. Ghana, Senegal, and Swaziland in an attempt to expose young people to pre-employment skills have incorporated basic vocational skills into the lower or junior secondary school curriculum (AU, 2007). According to Akyeampong (2010), education was placed at the heart of Ghana’s economic and social development and led to the formulation of policies following independence in 1957 and the 1961 Education Act; technical education, through the development of technical schools and polytechnics, was a key element of Ghana’s education plans.

The education in Ghana gained a wider credence with the introduction of the Free and Compulsory Universal Basic Education (FCUBE), as well as equal access to tertiary education with emphasis on science and technology. This intervention was as a result of the Constitutional Provision in 1992, Section 25 (1) and 38 (1).

Aryeetey et al. (2011) cited Preddey’s (2005) study which showed that from 1967, continuation schools were established for learners who were not selected for secondary education. These continuation schools emphasized pre-vocational education; this contributed to the erosion of TVET’s credibility, as it was viewed as a route for those who had failed to progress in academic education. The National Vocational Training Institute was established in 1970 to provide national co-ordination of TVET (Preddey, 2005). Its remit included apprenticeships, standards and certification, and labour market monitoring. It also set up a network of training centres which remain in place today.

Gondwe and Walenkamp (2011) and Duodu (2006) showed that the Pre-tertiary level technical and vocational education in Ghana historically took place in two distinct environments: formal education environments and informal training environments. The formal TVET sub-system consists of institutions that provide classroom and workshop-based instruction. They follow written curricula and students take formal examinations for which certificates are awarded. Informal TVET covers the traditional apprenticeship system, on-the-job training and all skills-training activities that do not lead to formal certification.

Gondwe and Walenkamp (2011) in their overview of the Ghanaian Education System explained that entry to university education required passing a university entrance examination. The academic programmes offered included Bachelors, Masters and Doctorate education, as well as sub-degree professional education courses (certificates and diplomas) through their affiliation with local tertiary level professional education institutions. The overview further indicated that higher professional education was offered at polytechnics and specialized colleges. The Polytechnics have not always been part of the tertiary education system in Ghana but were however upgraded to this level in 1992 through the Polytechnics Law (PNDC Law 321; Ghana MOESS, 2008). The programmes of study differed in these two institutions of higher learning in that the polytechnics prepare students for practice-oriented middle-level professions. The entry requirement is a senior high school leaving certificate from a technical secondary school or completion of general technical or craft courses at a technical institute. Courses offered are based on CGLI courses but lead to local examinations resulting in the award of advanced technician and craft certificates or the Higher National Diploma (HND). In
addition, holders of the HND can continue their study for approximately two years to obtain the Bachelor of Technology (B.Tech) degree. In Ghana, the B.Tech degree is the highest obtainable professional qualification with a strong practical component. The HND and B.Tech correspond to Levels 6 and 7, respectively, which are the highest levels that can be achieved in the Ghanaian national qualification framework for TVET. The Level 6 qualification indicates considerable theoretical knowledge and solid practical skills. Sophisticated application of technical knowledge is expected at this level. Level 7 indicates a high level of technical competence, conceptual knowledge and professional skills in a broad range of activities in complex and changing contexts (Addy, 2008).

In addition to polytechnics, there are also public and private specialized colleges which operate at post-senior high school level and offer professional courses ranging from three months to three years. Admission requires the senior high school leaving certificate or equivalent and/or work experience. The courses include substantial practical work and usually lead to the award of a certificate from the college and/or the relevant government ministry running the college (Gondwe and Walenkamp 2011). Roeske (2003) reports that formal, and often informal TVET is still predominantly supply-driven, long-term (usually up to three years), institution-based (with hours and location inadequate for working youth), costly, and entrance requirements are totally inaccessible for working children and youth. Furthermore, the traditional apprenticeship training (TAT), system, which provides skills training for up to 90% of the population of the countries in the sub-region, has been continuously going down, neglected by Governments, emptied of its traditional content, regulations, and values, and is looked down upon by the population. Within the early 1990s, numerous concerns were raised about the effectiveness of TVET in Ghana. Nyankov (1996) summarized these concerns and included poor quality in the delivery of TVET programmes; high cost of training; training not suited to actual socio-economic conditions; disregard of the needs of the informal sector; and disregard of the labour market and high unemployment rate among graduates.

This study looks at the more practical approaches to be used by governments and stakeholder considerations to be inculcated into any policy geared towards the total development of the TVET programme, a case study of four institutions in Ghana.

MATERIALS AND METHODS

The study population comprised the staff and students of four educational institutions namely Koforidua Polytechnic, Koforidua Secondary Technical School, St. Mary’s International School and Mile 50 Municipal Assembly Junior High School, all in the New Juaben Municipality of the Eastern region of Ghana. A sample size of 216 respondents was recruited. The stratified sampling technique was adopted as it embraced the distinct categories and organized them into separate strata. Simple random sampling was employed in selecting the respondents. Two separate open and closed-ended questionnaires were designed for the study, addition to an interview schedule, to capture the responses of the various categories of respondents. The design was guided by the material acquired for the literature review of the study. The data was analyzed using SPSS (Version 17) and Microsoft Excel.
RESULTS

There were variations in ratios in terms of gender distribution of the respondents across the various levels of education in TVET. Generally, a larger proportion (42.1%) of the respondents came from the basic level, 29.2% from the secondary/technical level, 20.8% from the tertiary level, and 7.9% were educational experts (Table 1).

Table 1: Profile of Respondents

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic level</td>
<td>91</td>
<td>42.1</td>
</tr>
<tr>
<td>Secondary/Technical level</td>
<td>63</td>
<td>29.2</td>
</tr>
<tr>
<td>Tertiary</td>
<td>17</td>
<td>7.9</td>
</tr>
<tr>
<td>Total</td>
<td>216</td>
<td>100.0</td>
</tr>
</tbody>
</table>

At the Basic level, 52.7% were females and 47.3% were males; at the Secondary/Technical level, 55.6% were males and 44.4% were females; at the tertiary level, 60% were males while 49% were females; for the experts (tutors, lecturers and career counselors), 76.5% were males 23.5% were females (Figure 1). Analysis of the various factors influencing the choice of a career in TVET indicated that at the basic level, 17.6% had their parents choose the TVET programme for them, 62.6% attributed their choice to their grades/performance, 11% based on job prospects, and 8% had their choice based encouraged their role models (Figure 2). At the Secondary/Technical level, 14.3% of the respondents were asked by their parents to choose the TVET career, 58.7% attributed their choice to their grades, 19.1% mentioned job prospects, and remaining mentioned role models.
At the Tertiary level, 6.7% of respondents were influenced their parents 20.0%, based their career choice on their grades and 73.3% cited job prospects as a basis for their choice (Figure 2).
Figure 1: Gender Distribution of Respondents across Education Levels

The respondents from Secondary/Technical and Tertiary institutions were asked if there were enough facilities available in their institutions to help them get the best training out of the TVET course. A majority 85.2% did not have while a few (14.6%) were positive (Table 2).

In terms of priority of choice, at the secondary/technical level, 20.6% of respondents claimed they choose a TVET programme as their first choice, while 42.9% said it was their third choice; However, 33.3% said they never choose it (Table 3). Among the tertiary respondents, 86.7% choose the TVET as their first option of study, and 13.3% opted for it as a second choice programme (Table 3).

When asked if they would pursue a TVET programme, many (61.5%) of the basic level pupils said they will not, while only a few (28.6%) opted for it as a third choice programme at the Secondary/Technical School level. A paltry 2 (2.2%) claimed it would be their first choice, while and 7.7% would choose it as second (Table 4).

Table 2: Respondents Opinion on availability of infrastructure and Facilities in Secondary/Technical and Tertiary institutions.

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>16</td>
<td>14.8</td>
</tr>
<tr>
<td>No</td>
<td>92</td>
<td>85.2</td>
</tr>
<tr>
<td>Total</td>
<td>108</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 3: Rating of TVET programme of study by Choice? (Sec/Tech & Tertiary)

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sec/Tech</td>
<td>Tertiary</td>
<td>Sec/Tech</td>
<td>Tertiary</td>
</tr>
<tr>
<td>First</td>
<td>13</td>
<td>39</td>
<td>20.6</td>
<td>86.7</td>
</tr>
<tr>
<td>Second</td>
<td>2</td>
<td>6</td>
<td>3.2</td>
<td>13.3</td>
</tr>
<tr>
<td>Third</td>
<td>27</td>
<td>0</td>
<td>42.9</td>
<td>0</td>
</tr>
<tr>
<td>None</td>
<td>21</td>
<td>0</td>
<td>33.3</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>45</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4: Choice for a TVET programme at the Basic level

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td>Second</td>
<td>7</td>
<td>7.7</td>
</tr>
<tr>
<td>Third</td>
<td>26</td>
<td>28.6</td>
</tr>
<tr>
<td>None</td>
<td>56</td>
<td>61.5</td>
</tr>
<tr>
<td>Total</td>
<td>91</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Majority of the experts (88.2%) commented on the fact that most parents preferred to choose a non-technical and vocational programme for their wards citing that such careers or jobs in the technical did not carry much prestige. The remaining (11.8%) indicated that in the view of parents, technical and vocational programmes were a preserve for students who did not perform well academically.

On the question of whether the content of the curricular met the needs of industry, 65% of the experts strongly agreed to the claim that there was need to review the curricular to be abreast with the changing trends in the industry, whilst 15% were indifferent. The remaining 20% disagreed that the content of the curricular be revised.

The question of educational managers preferring to mount and run programmes in institutions other than technical and vocational ones resulted in an overwhelming agreed upon, with 70.6% of respondents strongly agreeing and 29.4% disagreeing to that assertion.
DISCUSSION AND CONCLUSION

In Ghana, there is the perception that majority of the courses students undertake at their secondary and tertiary level are as a result of the influence of parents. It is even believed that some parents determine the kind of profession their children should undertake even against their wish. The reasons ascribed by students who decided to choose it as a programme of study explained that their teachers asked them to do so on the basis of their performance and the fact that it will help them gain admission into a school after their basic education. According to Anamuah-Mensah (2004) there is also negative public attitude towards TVET which makes TVET the last option for many students. It is against this background that the study sought to find out the choice of these students in the TVET programme.

The study revealed that at the basic and secondary/technical level the, the dominant factor for the selection of careers in TVET is the grades of the student while at the tertiary level job prospects was considered. There was preference for white-collar jobs than blue-collar ones as the latter was seen a preserve for academically weak students. Matching industry needs to curriculum design as well as educational managers’ neglect for technical/vocational programmes hampered the growth of TVET. Government legislators were not proactive enough to commit to real growth and promotion of vocational and technical education.

In the area of infrastructure and facility provision, it is clear that the existing equipment and facilities were obsolete and inadequate to cater for present demands on them. The results affirmed that there were inadequate facilities and infrastructure available for their training. It came to limelight through the researcher’s interaction with the respondents that most of the equipment in the laboratories and demonstration rooms were obsolete and there was pressure on the few working ones. Those who responded in the negative commented that there were instances when they were compelled to purchase their own instruments and equipment during practical sessions. This finding confirms the assertion by Antwi-Boasiako (2010) that out of the 23 public technical institutes under the Ghana Education Service (GES), only four can qualify to be called technical institutes. The rest are ill-equipped. The experts overwhelmingly indicated that government was not committed to actual provision of funds to proactively support and sustain technical and vocational education in Ghana. They cited low motivation for staff in the sector. In their comments to explain this position, the respondents claimed that the demand for commerce programmes is high, the cost involved to run it is less compared to TVET ones. They further reiterated that it is easier to attract lecturers in the field of commerce than in the technical/vocational fields. On the contrary, the experts cited that recently there has been a gradual upward trend for the choice of vocational
programmes. They cited Home Economics as an example, and hinted that it was now an accepted programme for entry into nursing training colleges. The experts interviewed also stated that legislators have not given much credence to coming up with a strong workable legislature to see to it that the technical and vocational training is boosted. They added that now that Ghana has found oil, most workers on the respective rigs and off-shore production sites were expatriates and Ghanaians only occupied less technical areas. This trend they claimed is not desirable and needed to be tackled with good policies.

The respondents disagreed that the content of the curricular needs to be revised, contrary to the view expressed by Nyarko (2011) that there should be a strong collaboration between industry, who are considered as major stakeholders, and academia in the design and review of curricular. This would ensure that the programmes run by the institutions are more relevant to the needs of industry and society as a whole. On the issue of the adequacy of TVET professionals in the classroom, the respondents (experts) claimed that most of the few professionals preferred to remain in industry as it was more lucrative. They indicated that the industry experience of such professionals is needed in the classrooms to help build both the confidence and expertise of the trainees and students.

The results of the study revealed that actual provision of infrastructure and facilities in institutions, increased government commitment in fund provision and tailor-making the curricular to suit industry needs were prominent in ensuring that TVET programmes were among preferred study courses for students. On the contrary, educational managers’ focus on the commerce programmes, lack of effective working legislature, inadequate professionals in the classrooms and parental preference for “white collar” professions hampered the sustainability of TVET choices.

It is recommended that there should be a more proactive promotion of TVET programmes and activities from the basic level of education through to the professional levels. Governments should bring on board all the key stakeholders in technical and vocational education to streamline effective, realistic and workable policies for attracting potential individuals into TVET careers.

State agencies and institutions which promote technical and vocational training and education should be well resourced and empowered to fully act in their legislative capacities to lift the image of technical and vocational education.
REFERENCES


Development of a Mobile Juicer with Cooling System for Retailing Fresh Fruit Products

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ABSTRACT

The traditional practice of hawking prepared fresh fruit products on the street has the negative perception of poor hygiene which is a concern for health conscious consumers in Nigeria. The FAO/WHO recommend individual daily intake of at least 400g of fruits and vegetables for good health which is hardly achieved in the meals. The project was therefore conceived in order to upgrade the practice of selling sliced fruit products by providing a mobile system fitted with a hygienic closet and powered by the engine of a tri-cycle (cargo/CGL 125) incorporated with devices that cool and extract juices for retail at different locations. The system comprise three main units namely; mobility, electrical charging/storage and cooling cabinet. The project deliverable has shown promise in adapting the tricycle engine to power an on-wheel mechanism that generate electricity for cooling fresh fruit products and extract juices with minimal quality losses over nine hours retail time. Public perception from respondents on the usefulness of the system for business was positive. Further work is recommended to use solar panel and to prepare a business plan for running it as an enterprise for self-employment.

Key words: Development, Juicer, Cooling-system, Retail, Self-employment

INTRODUCTION

A larger population of Nigerians hardly eat fruits as part of their meals except as part of cooking. Most of the commercially available fruit juices or drinks contain chemical preservatives and are more often avoided by health conscious people. Traditional street hawking of freshly prepared fruit slices has the negative perception of poor hygiene and therefore places the quality and safety in doubt for good patronage. However, research has shown significant contribution of street/hawked foods to the nutrient intake by Nigerian adolescents (Oguntona and Kanye, 2007). Fresh fruits, in particular, are good for health because they are packed with vitamins and minerals as well as anti-oxidants which help to eliminate harmful free radicals called oxidants. Free radicals are believed to contribute to a host of health problems, including heart disease, diabetics and cancers (Liu, 2003). A daily intake of at least
400g of fruit and vegetables, within the context of ensuring a better general dieting pattern has been recommended as appropriate to decrease prevalence and incidences of chronic diseases and reduce micronutrient deficiencies (FAO/WHO, 2004).

This project was therefore conceived to provide a means by which fresh fruit can be hygienically prepared on wheels (tricycle), cooled as such or extracted into juice (in-situ) if desired for retail to the public at different locations. The project has the overall goal of providing a mobile outfit which is safer than the traditional practices that could possibly spur interest in consumption of fresh fruits to meet the FAO recommended level of 400g/day and also create jobs for self employment. Specifically, the project aimed at developing a mobile system powered by tricycle engine which can cool fresh fruit products and extract juices when desired for retail at different locations. Test-trials of the system performance on quality of fresh fruit products over a maximum retail period of nine hours in a day. A public appraisal of the system was conducted for possible acceptance to run as an enterprise.

**MATERIALS AND METHODS**

**Development of the Mobile Juicer with Cooling System**

The system is comprise of three units: A mobility cooling unit, electrical charging and storage unit and the cooling unit (Fig 1, 2 and 3)
The mobility unit is made up of a tri-cycle (cargo/CGL 125) equipped with a 15 hp petrol engine; a cabin was constructed on the rear part of the chassis to house the cooling unit and juicer devices. The electrical charging and storage unit comprise of a 24V alternator, 2 deep-cycle batteries (200AH) and an inverter (3000W). An adaptor was worked into one end of the engine to tap power from the engine which is transmitted through the adaptor with pulley and belt arrangement to the alternator which converts the mechanical energy to an electrical energy (D.C). The current generated by the alternator is stored in the 2 deep-cycle batteries connected in series. The power in the batteries is made available for use through a 3KW commercial inverter which converts the current from D.C to A.C.

The cooling unit comprise of the cooling cabinet (1000mm x 500mm x 1350mm) condenser compartment (commercial tube and wire condenser with turns) plate evaporator, compressor (1/5hp) and the copper pipe network (2m). The design calculations of the unit were carried out using mathematical analysis obtained by weight and energy balance in addition to the relations between temperature, pressure, concentration and enthalpy of the solution.

In the design of the cooling unit, the following assumptions were considered: the liquid phase is in local thermal equilibrium with the gaseous phase in the compressor; the gaseous phase is treated as an ideal gas; all specific heats of the components and the heat transfer coefficients have been assumed to be constant; the thermal losses along the pipes have been neglected.
The time-temperature measurements for the cooling unit and ambient were recorded at interval of 30 minutes for over 5 hours without load. Performance tests were carried out after the system had been assembled (Plate 2-4).

The cabinet area and volume were also determined by calculations as follows;

Cabinet area = [up and down] + [two opposite sides] + [front and back sides]

Mathematically

\[
CA = [2wd] + [2hd] + [2wh] = [2x0.9x0.9] + [2x0.9x0.5] + [2x0.9x0.9] = 3.42m^2
\]

Cabinet volume (CV)

\[
CV = \text{Area of the top side of the cabinet (wd)} \times \text{height of the cabinet (h)}
\]

\[
CV = wdh = (0.9x0.5x0.9)m^3 = 0.405m^3
\]

The insulation thickness of 50mm (fibre glass) was utilized.

The coefficient of performance (C.O.P) of the cooling unit was used to measure the performance of the refrigeration system expressing its output to input ratio given as:

\[
C.O.P = \frac{t_1}{t_2-t_1} = 0.83 \approx 1.0 \text{ (table 2)}
\]

Where \( t_1 \) = lowest temperature (15\(^0\)c)

\( t_2 \) = highest temperature (33\(^0\)c)

**Testing the Quality of Fruit Product Over Time (Hrs)**

The fruits used were orange (Citrus sinensis), pineapple (Ananas comosus) and water melon (Citrus lanatis) which were all purchased from Bakhindogo market in Kaduna. The fruits were manually prepared within the system and packed into disposable containers before loading into the cooling cabinet. Temperature readings of the prepared fruit products were taken at 0, 3, 6 and 9hrs respectively. Fruit juice extraction was done by using a multipro-excel centrifuge extractor powered by the system. By adopting known procedures (Balami et al., 2004; Ishiwu and Oluka, 2004; Oyeleke and Olaniyi, 2007), the extracted juice was used to carry out other quality determinations such as percentage yield of juice, pH, total solid, ascorbic acid (Vitamin C) and total titrable acidity over the same retail
period of between 0 to 9hrs respectively at the different temperature readings.

**Public Perception of the System on usefulness for Business**

The system was exhibited with practical demonstrations at two locations in Nigeria namely; (a) Textile and Fashion Technology exhibition at the main campus of Kaduna Polytechnic in October, 2012 (b) Federal Ministry of Education- Exhibition for tertiary institution at old parade ground Abuja in November, 2012).

A semi-structured questionnaire was administered to 30 adult respondents in each case. The following information were elicited:

i. Public perception of its usefulness for retailing fresh fruit products

ii. Public opinion on whether it can be adopted to run as a business venture

iii. Individual preference(s) for fresh fruit products or mixtures

iv. What influences dominance in the individual choice for consumption of fresh fruit products

v. Suggestions on other features to be incorporated in the system.
RESULTS

The Mobile System

The results for time-temperature measurements for the cooling unit and ambient were recorded at interval of 30 minutes for over 5 hours without load are shown in Table 1. From Table 1, it was observed that after 3 hours of operating the chilling unit, the temperature was brought to a constant at 15°C (wet and dry bulb).

Table 1: Results of Temperature-Time Relationship (without load)

<table>
<thead>
<tr>
<th>Time (Minutes)</th>
<th>Cabinet Temperature °C</th>
<th>Ambient Temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dry bulb</td>
<td>Wet bulb</td>
</tr>
<tr>
<td>0</td>
<td>33</td>
<td>32</td>
</tr>
<tr>
<td>30</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>60</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>120</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>180</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>240</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>300</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>360</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>420</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>480</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

The results of cabinet area and volume calculations were as shown in Table 2.

Table 2: Results of other Measurements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabinet area</td>
<td>3.42 m²</td>
</tr>
<tr>
<td>Cabinet volume</td>
<td>0.405 m³</td>
</tr>
<tr>
<td>Coefficient of performance (COP)</td>
<td>0.83 ≈ 1</td>
</tr>
</tbody>
</table>

Changes in the Quality of Fruit Product Over Time

Table 3 shows changes in temperature, pH, total solids, ascorbic acid and total titratable acidity for the three samples (in cooling cabinet) and control (ambient temperature) from 0 to 9 hours the expected retail period/day. In orange samples, ascorbic acid (AA) reduced from initial content of 48.8 to 46.8 mg/100 ml representing 4% loss after 9 hours at cabinet temperature of 18°C. The control in ambient condition (28°C) gave a reading of 38.2 mg/100 ml thus representing 22% loss after 9 hours.
Table 3: Changes in Quality of Fruit Slices over Time

<table>
<thead>
<tr>
<th>Temperature°C</th>
<th>pH</th>
<th>TS%</th>
<th>AC(mg/100ml)</th>
<th>TTA%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time(Hr) 0 OWM P O WM P O WM P</td>
<td>O WM P O WM P O WM P</td>
<td>O WM P O WM P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 28 27 28 3.53 5.80 4.20 16 14 13 48.8 9.5 28.9 0.3 0.26 0.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 22 21 21 3.79 5.18 4.18 14 12 12 47.2 9.3 27.1 6.32 0.28 0.74</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 21 20 20 3.82 5.12 4.30 11 12 11 47.0 8.5 24.5 0.35 0.31 0.70</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 18 18 18 3.90 5.01 4.40 11 11 10 46.8 8.1 24.0 0.37 0.31 0.70</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ctrl 9 28 27 28 4.37 5.07 4.83 12 9 10 38.6 4.4 12.5 0.40 0.30 0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TS: Total solid  AC: Ascorbic acid  TTA: Total Titrable Acidity  Ctrl: Control
O: Orange  WM: Watermelon  P: Pineapple

Percentage Changes in Juice Yield over Time

Table 4 shows the juice yield (%) for all samples and the control overtime.

Table 4: Changes in Juice Yield (%) Over Time

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature °C</th>
<th>% Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O WM P</td>
<td>O WM P</td>
</tr>
<tr>
<td>0</td>
<td>27 27 27 50</td>
<td>58 59</td>
</tr>
<tr>
<td>3</td>
<td>22 21 22 46</td>
<td>40 57</td>
</tr>
<tr>
<td>6</td>
<td>21 20 21 44.2</td>
<td>39 56</td>
</tr>
<tr>
<td>9</td>
<td>18 18 18 44.2</td>
<td>38.8 56</td>
</tr>
<tr>
<td>Ctrl</td>
<td>28 28 28 52</td>
<td>43 61</td>
</tr>
</tbody>
</table>

O: Orange  WM: Watermelon  P: Pineapple

Public Appraisal on the System

Results of Public Appraisal on the System are shown in Table 5.
Table 5: Summary of Results on Public Appraisal

<table>
<thead>
<tr>
<th>Parameter</th>
<th>At Fashion exhibition in Kaduna %</th>
<th>At exhibition organised by FME for Tertiary Institutions in Abuja %</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Public Perception on its usefulness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very useful</td>
<td>67</td>
<td>33</td>
<td>Public perception is Positive</td>
</tr>
<tr>
<td>Useful</td>
<td>27</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Not useful</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>*Acceptance for business</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>100</td>
<td>100</td>
<td>All accepted as good for business</td>
</tr>
<tr>
<td>No</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>* Other technical features to be incorporated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advert on health benefit, automatic peeler/slicer</td>
<td></td>
<td>Inscribed contact, music and snacks</td>
<td>Music, complimentary benefit, automatic telephone, adverts on</td>
</tr>
<tr>
<td>*On support services required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training on usage</td>
<td></td>
<td></td>
<td>Need for business plan, and technical support on maintenance are dominant</td>
</tr>
<tr>
<td>Business Plan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back-up from home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance Support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Individual preference for fresh fruit products</td>
<td></td>
<td></td>
<td>Mixture of fruit product and orange are dominant</td>
</tr>
<tr>
<td>Orange</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water melon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bananas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guava</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pineapple</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*What influences choice on consumption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product taste</td>
<td></td>
<td>Health benefit</td>
<td>Health benfits and hygiene are dominant</td>
</tr>
<tr>
<td>Health Benefit</td>
<td></td>
<td>Hygiene</td>
<td></td>
</tr>
<tr>
<td>Hygiene and Nutrition</td>
<td></td>
<td>When served chilled</td>
<td></td>
</tr>
</tbody>
</table>

**DISCUSSION AND CONCLUSIONS**

When both dry bulb and wet bulb lowest temperatures were traced on a psychrometric chart, a 100% relative humidity was obtained which implies that air within the cabinet was saturated, a condition suitable to retain the moisture content of sliced fruits. According to Tan (2006), ideal storage conditions for whole fresh fruits are as follows: Bananas 12.5°C – 21°C at
85°C – 95% RH; Pawpaw 7°C – 13°C at 85°C – 90% RH; Pineapple 5°C – 20°C at 85°C – 90% RH; Orange 0°C – 9°C at 85°C – 90% RH.

The experimental results on the performance of the refrigeration unit (chiller) show that the machine has a C.O.P of 0.83, approximately 1. This conforms with the standard normal performance of single effect refrigeration of about 1.00 to 2.00 (Ugwu, 2012).

The results on quality of fruit slices for the three samples (in cooling cabinet) and control (ambient temperature) from 0 to 9 hrs for the expected retail period/day were comparable with other samples. According to Gil et al. (2006) and Wright & Kader, (1997), postharvest losses particularly vitamin C content can be substantial and enhanced by high temperature, physical damage (cutting), extended storage condition, light exposure under which ascorbic oxidase promote its transformation to dehydroascorbic acid (DHA). The results also show a general reduction in the soluble solid content and titrable acid as pH increases over time a phenomenon which can be related to losses in fruit characteristics such as firmness and visual appearance (Gil, 2006).

Decrease in cabinet temperature tend to decrease the fruit yield over time possibly due to loss of texture that enhances drip loss. According to Arpasson et al. (2012), one major problem with frozen fruits is a loss of texture which significantly decrease the percentages firmness and increase drip loss.

Public appraisal of the system shows positive perception on its usefulness. According to previous reviews of several authors, Chuttur, (2009) and Kelly et al., (2002) in using the Technology Acceptance Model (TAM) for explaining and predicting system use which indicates that there is a strong correlation between reported intention and system usage with perceived usefulness and perceived ease of use to have direct influence on behavioral intention. Since the system is perceived to be either very useful or useful from the results, the TAM theory/model can be inferred that the system is accepted. The results have also suggested other technical and business support services to be included to run it as an enterprise such as music, snack, contact information, business plan and maintenance services.

Furthermore, mixtures of fruit product and orange are dominant individual preferences for fresh fruit products while the consumption is mostly influenced by the envisaged health benefits and hygiene. Since hygiene is a concern on the current traditional practice of hawking fruit products, the system may therefore provide a relief for greater public patronage and hence increase in consumption of fresh fruit products towards meeting the recommended daily intake of 400g/day (FAO/WHO, 2004).

The project work has shown promise in adapting the tricycle engine to power an on-wheel mechanism that will generate
electricity for cooling fresh fruit products and extracting the juice when desired at retail outlets. The changes in quality of fruit products in the system overtime was minimal when compared with those under ambient condition. Finally, there is positive perception on the usefulness of the system by the public for it to be adopted in business.

The following recommendations are made:

i. Further research is necessary to use solar panel for generating electricity to compliment the tricycle engine for the incorporation of other processing units such as peeling, dicing and dispensing.

ii. The increase of electricity from panel will allow for a higher capacity compressor to be used that will further enhance the performance of cooling.

iii. Necessary support should be given for the patenting of the invention.

iv. A business plan of this venture should be carried out to provide a road map that can run it as a profitable enterprise.

REFERENCES


Ishiwu CN and Oluka SI (2004). Development of Performance Evaluation of Juice Extractor. 5th International Conference and 26th annual General Meeting of the Nigerian Institution of Agricultural Engineers 26, 391-395.


Tan S (2006). Storage conditions for fresh fruit. Government of Western Australia, Department of Agriculture and Food Note:145.


Sustainable Growth through Development of Small and Medium Enterprises Linked to Tertiary Institutions in the Republic of Tanzania

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ABSTRACT

There is urgent need to set a steady transformation scene in Tanzania for Small and Medium Enterprises linked to tertiary institutions. The initiative has potential of creating employment opportunities through the uptake of technologies and engagement of highly trained human resource in the institutions. The undertaking may result in business spin offs across the broad spectrum of economic sector. Small Industries Development Organization with which many Small and Medium Enterprises are registered in the Republic Tanzania was established to promote development of small scale industries. However, in direct response to growing demand from clients, donors and Government, Small Industries Development Organization progressively engaged itself in supporting micro businesses, particularly in the informal sector. Regardless of Small Industries Development Organization's mission to develop, create, promote and sustain, indigenous entrepreneurial base in the small scale industries and micro businesses, their goals have not been achieved successfully. The paper explores the potential contribution of Higher Learning Institutions in establishment and survival of Small and Medium Enterprises. With the harnessed pool of critical skills, Higher Learning Institutions have the capacity to Train and conduct Research on entrepreneurship and survival of Small and Medium Enterprises for a stronger linkage between Higher Learning Institutions and Small Industries Development Organization.

Keywords: Enterprises, Industries, Development, Institutions, Research

INTRODUCTION

Small and Medium Enterprises (SMEs) like any other businesses initiative is dependent on relevant human resource availability to reap the dividend of a knowledge based economy. In this regard, successful businesses must engage a critical mass of well trained
human resource who are the products of Higher Learning Institutions (HLIs). The HLIs and businesses need to cultivate a mutually beneficial and long lasting relationship with one another. In this emerging framework, robust high-quality, long-term relationships, based on two-way investments of time and resources, are becoming essential to understand, influence and improve the interactions between both sectors.

To forge ahead with this transformation tertiary and HLIs will need to collaborate with the industrial sector to establish SMEs for self reliance and employment opportunity creation. At the same time, SMEs and government can facilitate the development of close links with Universities by venturing into campus for regular discussion and exchange of views on matters related to the preparedness of graduates for the workforce, and collaborative research. Individual academic staff members will often engage with professions in industry, adopting leadership roles in professional bodies, undertaking commercial research or consultancy. Besides they may also volunteer to participate in advisory panels of industries and professional bodies in different economic sectors. This strategic partnership needs to be encouraged at institutional and national levels.

The HLIs and business enterprises need to work together to build competitive regional economies. Regions seeking to compete more effectively within a world economy will need to develop ‘soft structures’ that support knowledge creation and learning that facilitates firms to collectively strengthen a state or region’s capacity for knowledge creation and innovation (Cairney 2000). Garlick (1998) argues that “many regional communities are feeling the demographic, social, economic and environmental impacts at which the respective areas are growing. Essentially, the rates are either well above the effective capacity to manage or well below the potential of their human, economic and physical resource capability”. creation of trust between the public and private sector as well as academia. He suggests that regional communities will heavily depend on HLIs to provide the necessary skills and knowledge to support socio-economic developments. Such a role is not consistent with the way in which HLIs have historically operated, that is, places where knowledge was sought by an elite few, and where it was protected and passed on as seen fit to restricted communities of interest. It should be noted that the link between HLIs and regions is not restricted to regional Higher Learning Institutions and the region(s) in which they are located. The relationship is significantly broader and extends to HLIs in both city and regional, which actively work with regionally-located industries and businesses.

To achieve this strategic partnership, new forms of governance need to be put in place. Generally, this can be achieved by paying attention to appointment of business leaders and professionals into University planning committees, advisory and management boards and business enterprises. Participation in joint board membership of regional
development and specialist organizations has the potential creating engagement of experts and mentors business incubation and Cairney (2000) has suggested that such regional development approaches require commercialization new products. It must be noted that institutional management must adopt a business approach in the daily operations. Many HLIs have in the recent past adopted a more corporate approach in the appointment of holders of all senior positions from Head of School / Department being appointed rather than elected. Higher Learning Institutions have also drawn significant lessons from business leaders and professionals in terms of council or senate membership alongside establishment of advisory and management boards. The paper explores the potential of creating collaborative linkage between academia and industrial sector for enhanced small and medium enterprises for sustainable growth.

MATERIALS AND METHODS

This conceptual paper adopted qualitative research method because of its exploratory nature. Archival technique of secondary data sources was employed to collect required data set collation and interpretation. The a forum for knowledge sharing, stream lining of governance structures besides collected data was analyzed using the Statistical Package for Social Scientists (SPSS). The collected data was subjected to content analyses (CA) to calculate means, frequency distributions and median. The adopted statistical approaches were in tandem with methodological outlines to achieve the set objectives.

RESULTS

Collected data sets showed the number of students who were engaged in industrial exchange programmes between 2007 and 2012 to have been on an increasing trend except for 2010, when there was no admission into the industry (Fig. 1). Similarly, the number of projects in which both SIDO and Academia were involved increased to reach a peak of 8 in 2012. The direct involvement of Mbeya University of Technology (MUST) in establishment of incubation centers is a significant stride the realization of sustainable socio-economic development (Fig. 2). Even though MUST engaged in consultancy services, it only secured on average about two consultancy projects per year (Fig. 3). The presented set of information demonstrates a weak linkage between Industry and academia.
Fig. 1: Number of Students Recorded to have Participated in Industrial Training from Mbeya University of Technology (MUST)

Fig. 2: Number of Projects Jointly Undertaken by Small Industries Development Organization and Academic institutions in Tanzania
DISCUSSIONS

Small Industries Development Organization (SIDO) is a parastatal organization which was established under the Act of Parliament No. 28 of 1973. The organization is mandated to plan, coordinate, promote and offer every form of services to SMEs. The responsibility of the organization includes entrepreneurship development and extension services, technology development and technical services, marketing, information and financial services.

In carrying out its mandate, SIDO has to achieve functions such as promotion and development of small and medium industries, plan and co-ordinate activities of small industries, carry out market research in goods manufactured by small industries besides advising the Government on all matters relating to development of small and medium industries. In addition, SIDO is charged with the responsibility of providing training facilities and
training of employees of small industries among others.

Until 1961, Tanzanian higher educational institutions could not produce the requisite pool of scientists, technicians and technologists needed by the industry. Despite the positive progress made, the country is still facing shortage of technically skilled workers. The country currently has inadequate number of engineers, technicians and technologists. Technological innovations adopted in the knowledge based economy have inherent challenges. The economic and technological challenges have led to higher unemployment rates in the wake of trying to achieve global competitiveness (Pratzner, 1994). There is however an iota of doubt on the ability of African teachers and existing institutions to prepare students for the workplace and higher education (Galluzo, 1996). This loss of confidence is fuelled by the belief that the present education system is incapable of producing learners with skills to meet the increasingly complex demands of the workplace especially the setups that require engineering skills (Makgato and Mbanguta, 2000). Most of the training curricula are outdated. There is need to focus on education that offers holistic training to the students to equip them with employable skills as well as those required for progression in higher education (Frentz, 1994).

The fact that Tanzanian engineering and technology education does not adequately meet the needs of the labour market, this can be attributed to a lack of a strong linkage between engineering and technology training institutions and the industrial sector (Vocational Education and Training Report, 1996 and Makgato, 1999). There is a mismatch between higher education training output and the needs of modern economy. There is need for a strengthened collaborative network between higher learning institutions and industrial sector for a transformational training for the labour market (Makgato, 1999). In addition to technical skills acquisition, there is need for imparting of entrepreneurial skills to engineering graduates so as to make them versatile and enable them become entrepreneurial engineers (Shimeld et al., 2001).

To achieve this, both SIDO and higher learning institutions need to explore possibilities of the establishment of technology and innovation Incubation centers. The Tanzanian government in 2011 renovated and converted sheds in Tanga, Arusha, Mwanza and Rukwa regions for use as incubation centers. There is a proposal to incubate innovators in premises within Higher Learning Institutions through the support of SIDO. The entire incubation period ranges between six months and three years during which the incubatees are to be provided with technical support to develop products and services to be marketed through the established Small and Medium Enterprise unit. The Academia and SIDO partnership has the potential of exploring synergies of technical skills development and ICT provision. This augers well with the national policy of ‘One District One Product” (ODOP)
besides supporting value addition on raw materials to create job opportunities for income generation for enhanced livelihoods.

**CONCLUSIONS**

Establishment of Small and Medium Enterprises (SMEs) through the partnership of Small Industries Development Organization and Academic institutions in Tanzania is an important milestone. The synergy between the two institutions has potential of creating employment opportunities in addition to the uptake of advance technologies that are developed by highly trained human resource available in institutions of higher learning. As Tanzania moves towards a more knowledge dependent economy, there is need to adopt collegial approach to socio-economic activities.

**REFERENCES**

Cairney TH (2000). The role of Universities in Developing Regional Knowledge Workers.


Modeling the Impact of Knowledge and Technology Transfer between TVET institutions and Industries

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ABSTRACT

A dynamical system is used to assess quantitatively the impact of knowledge transfer from Technical Vocational Education Training institutions to industries, and technology from industries to Technical Vocational Education Training where financing is a decisive input which control output of the whole process. The eigenvalues of matrix technique indicated the dynamical system to be stable as time approaching to infinity. Within this mathematical framework; the government fund to Technical Vocational Education Training institutions, $G(t)$, Technical Vocational Education Training institutions, $T(t)$ and industries productivity, $I(t)$ at time $t$ are three variables to depend on each other. In this context, a deterministic model to determine the importance of exchange of knowledge and technology between Technical Vocational Education Training institutions and industries as dynamical system was formulated and analyzed. Numerical simulations of the model were provided. The impact knowledge transfer from institutions to industry and technology from industries to institutions, also financing parameters were assessed. Simulations of model parameters indicates that the self financing of Technical Vocational Education Training institutions, transfer of knowledge from Technical Vocational Education Training institution and transfer of technology from industries to Technical Vocational Education Training institutions are sensitive parameters and they have positive impact. However, fund from government, private sectors, and cost sharing are the solutions of increasing efficiency of Technical Vocational Education Training institutions, industries and the government in general.

Key words: Knowledge, Technology, Financing, Productivity.

INTRODUCTION

Technical and Vocational Education and Training (TVET) refers to education and training that prepares persons for gainful employment.
In other words, TVET refers to deliberate interventions to bring about learning which would make people more productive or adequately productive in designated areas of economic activity, for example economic sectors, occupations, and specific work tasks. In great lakes zone, Rwanda is an example to address the critical needs for technical and entrepreneurship skilled manpower, in addition to improving the quality and relevance of TVET. As a result of skill acquisition by most Tumba College of Technology (TCT) graduates, they are expected to start their own business, with a view to promote this activity. A consultant has since been engaged by the government where more than 50% of the final year students are supported (Republic of Rwanda, accessed 2009).

Japan International Cooperation Agency (JICA), has provided immense support for maximizing efficiency and effectiveness in implementing of TVET programmes in some African countries, most prominently Ghana, Uganda, Malawi and many others.

In Zimbabwe, bulk of funding for TVET suggested that it should come from the government and Zimbabwe Manpower Development Fund (ZIMDEF) (96.6%). The scope of ZIMDEF funding is not very clear and seems to have changed from what it was at its inception in 1984 (UNESCO, 2005). However, the heavy reliance on these two sources of funding is certainly inconsistent with the 2002 United Nations Educational Scientific and Cultural Organization (UNESCO) and International Labour Organization (ILO) recommendations on TVET for the 21st century which stresses that TVET funding should be a shared responsibility between government, the private sector, voluntary organizations, and the students themselves. It should however be understood that companies pay 1% of their annual salary wage bill as levies to ZIMDEF to support TVET programmes and are not in a position to pay more until the utilization of these funds become more transparent.

Tanzania has a mixed economy in which agriculture plays the leading role. Agriculture includes crops, livestock, fishery and hunting sub-sectors which contributes the largest share 45% to the Gross Domestic Product (GDP) (URT, 1996), and creates 80% employment. The industries or manufacturing sector is among the other sectors of economy next to agriculture in terms of employment creation and accounted for 9.2% of the Gross Domestic Product (GDP) in 2006 financial year (NBS, 2007). The tertiary training institutions such as Vocational Education and Training Authority (VETA) and Technical Colleges should orient their curricular to respond to demand driven skills development that enhances industrial productivity. National Strategy for Growth and Reduction of Poverty (NSGRP) 2005-2010, which is now under review, identified three major clusters of poverty reduction outcomes as: growth and reduction of income poverty, improvement of quality of life and social well-being, and good governance. NSGRP did not mention TVET explicitly to clarify its role in
promoting the envisaged growth and hence allow monitoring of its contribution. TVET is mentioned in passing as one of the goals for improvement of quality of life and there are no strategies for realizing the same as put forward for the case of basic education (URT, 2005).

In Tanzania, Vocational Education and Training (VET) and Technical Education and Training (TET) are distinct (Southern African Development Community (SADC) and United Nations Educational Scientific and Cultural Organization (UNESCO) (2010). National TVET Monitoring Report for Tanzania. National Stakeholders Workshop on 2nd November 2010, Protea Court Yard Hotel, Dar es Salaam). VET is governed by the Vocational Education and Training Act of 1994, which defines Vocational Education and Training to mean training that leads to a skilled occupation. On the other hand, TET is governed by the National Council for Technical Education Act of 1997, which defines Technical Education to mean education and training undertaken by students to equip them to play roles requiring higher levels of skill, knowledge and understanding and in which they take responsibility for their area of specialization. This discrepancy makes funding procedures especially for TET institutions unclear.

To achieve sustainable national, regional, and global competitiveness, any nation, continent or union has no choice but to become a vibrant knowledge economy. That is why, European Union launched the new Lisbon partnership for growth and jobs. Furthermore, the European Council singled out knowledge and innovation for growth as one of three main areas for action. In any country open to radical reform of Technical and Vocational Education and Training (TVET), policy can be usefully informed by comparative research experience with new models which has been tried out in other countries. Some new models include national training authorities, national training funds, and national qualification frameworks (InWEnt, accessed 2012). There is a need to systematize the existing findings and generate new ones by transferring technology from industries to TVET institutions. It is fundamental that researchers and industry work closely together and maximize the social and economic benefits of new ideas.

Knowledge transfer from TVET institutions to industries can help to orient research and education activities towards the needs of society. This also may involve temporary staff exchanges as well as through the hiring of young graduates by industry. Few companies to mention in developed countries: International Business Machines (IBM) from Armonk, New York, USA as one of the world’s largest computer and systems Integrators Company and Ford motor company in Dearborn Michigan is an American automaker and the world’s third largest automaker based on worldwide vehicle sales. These companies transfer their technology into universities and institutes of technology, for example British Columbia Institute of
Technology (BCIT) in Vancouver Canada benefit the exchange of knowledge and technology with these companies. The funding system of TVET institutions in many African countries is a problem, and limited researches have been conducted to address the knowledge and technology sharing between institutions and industries.

This work intended to address mathematically the role of transfer of knowledge from TVET to industries, the transfer of technology from industries to TVET institutions and financing system for sustainability. Data used in analysis are from The United Republic of Tanzania.

Model formulation and analysis

The model was formulated based on ideas involved in modeling disease transmission dynamics in a closed population by Kermack McKendrick in 1927. Three compartments S (for susceptible), I (for infectious) and R (for recovered), forms the SIR model of non linear three differential equations. The SIR model was used to develop linear differential equations as a dynamical system to track the coexistence of Government, Industries and TVET institutions. The model is free from boundary conditions because they have to be defined in a Memorandum of Understanding (MoU) signed between two parties as beneficiaries.

The model is based on the following assumptions: All international funding are included in government as they pass through ministries or national training authorities. TVET private institutions are assumed to have funds from the government but not equal to government institutions. At the same time some transaction at the international and national levels are exempted from tax or the tax paid under government subsidy. In developing countries like Tanzania, lack of capital for many graduates makes self employment to be less than employment in industries, hence labour productivity in self employment, $\phi$ is less than labour productivity in industries, $\varepsilon$ (i.e $0 < \phi < \varepsilon$). It is assumed that the government funding is always less than self financing of TVET institutions ($0 < \mu < \sigma$) to encourage the institutions think and set out goals to achieve so that they can easily reach a take off point. It is also assumed that micro industries are the same as self employment, the industry $I(t)$ is an average of small, medium and large industries. It is further assumed that all input and output resources are quantified and equals to money in US$.

The rate of funding is either directly from the industry ($\alpha > 0$) to the institution which is also important to facilitate learning activities or some are indirect through ministry or other training authorities. The detailed information about variables are in Table 1 and parameters of the model are given in Table 2. The full scenario on how these three variables, industries $I(t)$ which will be represented as $I$, the government $G(t)$ to be represented as $G$ and TVET institutions $T(t)$ represented as $T$ depends on each other as shown in Figure 1, which is a flow diagram of the
dynamical system, the system is full dynamic because it changes with change of time. From the flow diagram in Figure 1, and taking into consideration the assumptions based on this model for the purpose of mathematical theories to hold the model equations in (1) were obtained:

\[
\begin{align*}
\frac{dI}{dt} &= \Lambda + \tau G + (\varepsilon + \eta)T - (\lambda + \alpha + \beta)I, \\
\frac{dG}{dt} &= \Psi + \lambda I + \omega T - (\tau + \mu + \sigma)G, \quad \text{(1)} \\
\frac{dT}{dt} &= (\alpha + \beta)I + (\mu + \sigma)G - (\varepsilon + \eta + \omega + \phi)T.
\end{align*}
\]

Table 1: Description of Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition of a variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I(t))</td>
<td>The industries fund at time (t)</td>
</tr>
<tr>
<td>(G(t))</td>
<td>Government fund for TVET institutions at time (t)</td>
</tr>
<tr>
<td>(T(t))</td>
<td>Fund of TVET institutions at time (t)</td>
</tr>
</tbody>
</table>

Table 2: Parameter’s Description, Value and Source

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition/Description</th>
<th>Value (year)(^{1})</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\Lambda)</td>
<td>Average capital of industries</td>
<td>(3.75 \times 10^5)US$</td>
<td>(URT, 2007)</td>
</tr>
<tr>
<td>(\Psi)</td>
<td>Government fund for TVET institutions</td>
<td>(3.37 \times 10^8)US$</td>
<td>(URT, 2012)</td>
</tr>
<tr>
<td>(\alpha)</td>
<td>Financing rate from industries to TVET institutions</td>
<td>(3.30 \times 10^{-4})</td>
<td>*</td>
</tr>
<tr>
<td>(\beta)</td>
<td>Transfer of technology from industries to TVET institutions</td>
<td>0.75</td>
<td>Assumed</td>
</tr>
<tr>
<td>(\mu)</td>
<td>Financing rate from government to TVET institutions</td>
<td>0.024</td>
<td>**</td>
</tr>
<tr>
<td>(\sigma)</td>
<td>Self financing rate of TVET institutions</td>
<td>0.069</td>
<td>**</td>
</tr>
<tr>
<td>(\varepsilon)</td>
<td>Labour productivity rate in industries</td>
<td>(4.59 \times 10^{-6})</td>
<td>*</td>
</tr>
<tr>
<td>(\eta)</td>
<td>Transfer of knowledge from TVET institutions to industries</td>
<td>0.6</td>
<td>Assumed</td>
</tr>
<tr>
<td>(\omega)</td>
<td>Labour productivity rate in government sectors</td>
<td>(7.52 \times 10^{-7})</td>
<td>Assumed</td>
</tr>
<tr>
<td>(\phi)</td>
<td>Self employment labour productivity rate</td>
<td>(2.51 \times 10^{-9})</td>
<td>*</td>
</tr>
<tr>
<td>(\tau)</td>
<td>The rate at which the government support industries</td>
<td>0.02</td>
<td>*</td>
</tr>
<tr>
<td>(\lambda)</td>
<td>The rate at which the industries support the government</td>
<td>0.12</td>
<td>*</td>
</tr>
</tbody>
</table>

\(^{1}\)Calculated value using data from URT (2007) and \(^{2}\)calculated value using data from
URT (2012) as sources of information respectively. The detailed information regarding these calculations are clearly shown step by step in Appendix A.

**Positivity of Solutions**

For the model (1) to be meaningful, it is important to prove that all its state variables are none negative for all time. In other words, solutions of the model with positive initial data will remain positive for all time $t > 0$.

**Theorem**

*Let the initial data $(I, G, T) (0) > 0$, then the solution sets $(I, G, T) (t) > 0$ of the dynamic system (1) is positive for all $t > 0$.*

**Proof**

Let $t_1 = sup \left\{ (I, G, T) (0) > 0 \in [0, t] \right\}$, thus $t > 0$. It follows from first equation of the system (1) that:

$$\frac{dI(t)}{dt} = \Lambda + \pi G(t) + (\varepsilon + \eta)T(t) - (\lambda + \alpha + \beta)I(t) \geq - (\lambda + \alpha + \beta)I(t),$$

$$\frac{dI(t)}{dt} \geq - (\lambda + \alpha + \beta)I(t),$$

$$\int_0^t \frac{dI(t)}{dt} \geq - (\lambda + \alpha + \beta) \int_0^t dt,$$

$$I(t) \geq I(0)e^{- (\lambda + \alpha + \beta) t} > 0 \text{ because } (\lambda + \alpha + \beta) > 0. \text{ Therefore } I(t) > 0.$$

Similar procedures to the remaining two equations can be carried out to obtain $G(t) > 0$ and $T(t) > 0$. Hence $I(t) > 0$, $G(t) > 0$ and $I(t) > 0$, for all time $t > 0$.

**Stability of the System**

The stability of any system is an ability or characteristic of the system to maintain proper positioning during movement or small perturbations. In theory, marked instability should be associated with a negative development tendency of the corresponding system, and marked stability with positive development tendency. Industries, institutions and government are organs always aiming for positive development, for this model to be viable it must be stable. The eigenvalues of matrix technique to determine whether the system is stable or unstable was used as follows: When numerical values of parameters given in Table 2 are substituted in the linear ordinary differential equations (1), for the purpose of simplifying symbolic calculations, the following ordinary differential equations with numerical coefficients were obtained:
\[
\begin{align*}
\frac{dI}{dt} &= -0.870033I + 0.2G + 0.60000459T + 375000, \\
\frac{dG}{dt} &= 0.12I - 0.293G + 0.000000752T + 337000000, \\
\frac{dT}{dt} &= 0.750033I + 0.093G - 0.600945342T.
\end{align*}
\]

At none zero equilibrium point, the matrix of system (2) below was obtained,

\[
\begin{pmatrix}
-0.870033 & 0.2 & 0.60000459 \\
0.12 & -0.293 & 0.000000752 \\
0.750033 & 0.093 & -0.600945342
\end{pmatrix}
\]

The eigenvalues of matrix in (3) are \(-1.4281, -0.0005\) and \(-0.3354\). Eigenvalues tells us the exponential part of the solution of the differential equation system, three possible values for an eigenvalues are: positive real values signify that the system increase exponentially (unstable), negative real values means the system decays exponentially (stable) and imaginary values indicate the system is oscillating. Since the eigenvalues of this system are all negative real numbers, then the system is stable.

**Model Simulation**

**Variations of Funding and Production with Time**

The Ministry provides for a budget to each public institution and is centrally disbursed from the ministry head quarters; this is the recurrent budget to run the institutions. Fees paid by students, fund from industry through the industrial levy, bursary to needy students are provided at a limited minimum point. Gender issues are also taken care of by giving bursaries as incentives to female students doing Engineering, Science and Technology courses. In reality there is a lack of strong linkage of TVET institutions with the industry in terms financing and technology, also the government funding does not suffice institution needs. Because of these reasons the students can’t get the exact skills and technologies available in the industry. To generate the relationship between TVET institutions and industries in Figure 2, it is assumed that there is a very strong relationship between these two different units, the transfer of knowledge from institutions to industries is 60% (\(\eta = 0.6\)) and the
Transfer of technology from industries to TVET institutions is 75% ($\beta = 0.75$). If this mutual relationship persists for a long period, the productivity of institutions after 10 years will be much stable to the extent that they can stand in their own without direct government support, likewise for industries at 15 years as shown in Figure 2.

**Exchange of Knowledge and Technology between TVET institutions and Industries**

Transfer of technology ($\beta > 0$) from industries to institutions is inevitable for producing competence graduates, in this way institution will have an opportunity to train students exactly to what is in the market by that time and reduce the cost of new employee being trained by employer (industry), it also offer time for academicians to work on problems arises time to time on products reported by customers of respective industry as research work. In many countries TVET curriculum design switched away from long courses with assessment at the end, to programmes of short courses (modules) with assessment at the end of each module which makes trainee to meet their particular requirement in tailored mode of training.

**Financing Parameters**

Financing system to any institution in our country may be affected at any time because of unavoidable circumstances, for example, disaster, hunger, floods and lack of stable source of energy like electricity. Energy and environment are equally vital elements for industries development. Inefficient use of energy resources results into higher production costs and trigger more environmental degradation due to increasing efforts in search for energy to satisfy increased demand. When the production cost is high, the production goes down, and if there is no production in industries it is not possible for industries to keep financing TVET institutions, on the other hand tax revenue from industries to the government is proportional to the income of the industries. Institutions’ self financing incorporates many operation functions which are subject to customers whose income depends from many other sources including industries. If this chain is disturbed, it slows down the progress of TVET institutions. In Figure 4, it will takes about 35 years for TVET institutions to stabilize, while industries will take 15 year to become independent from government support when parameters $\mu$, $\alpha$, and $\sigma$ are minimized.

**The Importance of Self Financing of TVET institutions**

The need for more diversified source of finance in order to cope with high unit costs and tight public finance in public institutions are to be addressed. This would mean moving from full or nearly full reliance on ministerial budgets, to charge fees to trainees, to sell short courses to industry, to sell products produced in production units inside TVET institutions (training with production), and setting up channels of external funding by earmarked fiscal measures on the sector concerned (e.g., payroll tax) (InWEnt, accessed 2012). By increasing rate of self financing in institutions from $\sigma = 0.069$ to $\sigma = 20$, the TVET institutions will take-off within one
year as shown in Figure 5. This is a very sensitive parameter where the institutions in collaboration with government have to look on sustainable ways to crop up.

Figure 1: Model flow chart
Figure 2: The variations of government funding, industries and TVET institution productivity at initial values $I(0) = 5.0 \times 10^5 US\$, $G(0) = 3.0 \times 10^8 US\$ and $T(0) = 3.5 \times 10^8 US\$, parameter values from Table 2 or from MATLAB code attached as Appendix B were used.
Figure 3: The impact of reducing transfer of knowledge and technology between TVET institutions and industries \((\eta = 6.0 \times 10^{-6}, \beta = 7.5 \times 10^{-6})\), other values remain the same as in Figure 2.

Figure 4: Implications of reducing government fund \((\mu = 0.012)\), financing from industries \((\alpha = 0.000165)\) and self financing of TVET institutions \((\sigma = 0.0345)\) in parallel with values used in Figure 3.
Decline of financing TVET institutions, minimizing knowledge and technology sharing between institutions and industries push much forward the number of years to which the institutions can stand for their own financially.

Different definition of TVET in Tanzania which is characterized by the distinction between VET and TET cause difficulties in the use of indicator in the monitoring tool of financing the institutions. TVET is not a union matter in the United Republic of Tanzania hence Tanzania Mainland and Zanzibar have respective different policies, legislations and modes of financing TVET. In such situation, attempting to have one funding tool for the United Republic of Tanzania may not portray the true picture. That is why there was no data on TVET within Education Management Information Systems (EMIS) at the Ministry of Education and Vocational Training at the year 2010. To alleviate the situation TVET should be thought at the level of union and under the same authority. Otherwise the government has to set conducive environments to enable self financing of TVET institutions.

It is difficult to change the mindset of a human being, but all stakeholders are to understand that fund raising for education costs is very important than fund raising of wedding ceremonies. Now it is time for the whole community to restructure the way of living by putting forward education costs as part
and parcel of their life. This is one of the solutions to start with, which will enhance and promote self financing of institutions even though it may take time for the whole community to understand and adopt. Paying fees as private for students will create a culture of our students of developing skills of self employment.

All TVET institutions have to develop and review curricula based on feedback from employers, situation of sending students for industrial practical training annually, through contracted research and/or consultancy and this is possible through close partnership with industry. This work is not exhaustive in all areas, future work to address the same by focusing on how the model can be extended to include human resource as another item from fiscal resources, and where possible VETA and TET be treated as separate unit specifically in Tanzania where they operate at different policies. It also remains as a challenge to measure the labour productivity in government sectors.

ACKNOWLEDGMENTS

We acknowledge with thanks the support of Arusha Technical College through Read-Unit to sponsor this study, and all friends who much assisted in accomplishing this work in terms of moral time and materials.

REFERENCES


Students Motivation and Preference of Studying Hospitality and Tourism Management Programmes in Polytechnics: A Case Study Ho Polytechnic

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ABSTRACT

The main purpose of the study was to find out the motives and preference of students studying Hospitality and Tourism Management programmes in Ho Polytechnic. Questionnaires were administered to 113 Higher National Diploma students pursuing Hospitality and Tourism Management programme to solicit their views on the choice of programmes in Ho Polytechnic. Data was analyzed using (SPSS version 16). The results of the study revealed that, there were four motivational factors influencing the choice of Hospitality and Tourism Management programmes as follows: job opportunities at the government sector, parental influences, other factors and ease of studying the programme. The implication is that if these students are not educated on the choice of selecting programmes in tertiary institution before completing Senior High Schools, parental influences and other factors may enable them to opt for programmes that they may not be interested in, hence ending up not being in the right profession. Considering the rate at which the tourism industry is advancing there will a possibility of shortfall of skills in the tourism industry in the near future.

Keywords: Preference, Hospitality, Tourism, Motivation, Programme

INTRODUCTION

One of the fastest growing sectors in Ghana is the service sector which includes the tourism and hospitality (Ghana Tourist Board, 2008). According to (Ghana Tourist Board, 2008), tourism has been the third largest source of income for the country Ghana after Cocoa and Gold. The number of tourists’ arrivals and hotel rooms available has grown since the 1980s. The tourism sector in Ghana experienced sustainable steady increases in tourist arrivals from 145,780 in 1990 to 399,000 in 2000 and projected to be around 698,069 in 2008. The World Travel and Tourism Council argued that, the tourism sector contribute 9% of the global GDP or value of over
US$6 trillion and accounted for 255 million in 2011. It is further expected that, in the next ten years the industry is expected to grow by an average of 4% annually, taking it to 10% of global GDP or US$10 trillion. In addition, by 2022, it is anticipated that tourism will account for 328 million jobs. The influx of international tourists has increased and it is expected that the growth will continue. As the tourism and hospitality industry continues to grow, there is an urgent need for government to provide the needed infrastructure and human resources to commensurate the growth rate.

In an effort to address this challenging issues, the Ghana Tourist Authority in collaboration with Ministry of Tourism have set a criteria for standardization and provision of hospitality and tourism services to enhance service quality. All these policies set by the Ministry of tourism may therefore be meaningless unless it is linked up with appropriate educational provision for the development of the human resources to take up the challenging jobs in the tourism sector. The government of Ghana having realized the immense contribution that tourism makes to the economic development of the country: redefine its tourism education policy at tertiary level in all the ten regions in Ghana, to produce quality human resources needed for the fast growing tourism and hospitality sector. The Polytechnics started hospitality and tourism education in Higher National Diploma (HND) in 1993 to date. In Ghana the National Curriculum and course specification (the National Syllabus for HND in Hospitality and Tourism Management) was prepared at the request of the Ministry of Higher Education. It became necessary because of global changes, technology and the demand for qualified skilled personnel’s. There are ten Polytechnics in Ghana located in each region all offering three years Higher National Diploma (HND) in Hospitality and Tourism programmes and other disciplines. Some of the Polytechnics also run top up degree programmes thus Bachelor of Technology (BTech.) Programmes in tourism and hospitality and other Universities offering BSc and MPhil degrees Programmes in Hospitality and Tourism Management and other related disciplines. From 1993 to 2005 enrolment statistics of students on HTM programmes for instance in Ho Polytechnic shows that, few students enrolled on these programme. It is clear that there has been a dramatic change in students enrolment level on HTM programmes from 2006 to date depicted. This situation is not different from other Polytechnics.

Meanwhile, the issue of HTM study motivation has drawn serious attention from some researchers (Kim et al; 2007, Hjalager, 2003). According to them, there has been little research on students’ motivations and preference for studying HTM programmes. It has therefore become imperative for one to conduct a research of this sort. The purpose of this study is to investigate students’ motives and preference of studying hospitality and tourism management programmes in
polytechnics: using second year HTM students in Ho polytechnic.

Motivation was and will still be the subject of many theoretically studies. Process theories (Adams; Vroom, Porter-Lawler, 1964) assumed the differences in people’s needs and focus on the cognitive processes that create these differences. The content theories (Maslow, 1954; Hertzberg, 1959; McGregor, 1960; McClelland, 1961; Alderfer, 1972; Mumford, 1976) suggest that people have the same needs. As the composition of the age group changes rapidly, what and how people are motivated are not easy questions. However, motivation is different from preference. Motivation implies a drive towards a result while preference could be conceived as an individual’s attitude towards a set of objects, typically reflect in an explicit decision-making (Lichtenstein and Slovic, 2006). According to Lichtenstein and Slovic the choice of behaviour is an emotionally-rationally individual option and for each generation, there are particular experiences that mould specific preference, expectations and beliefs (O’Malley, 2006). However, several studies investigate student’s motives and preference for opting for college majors in other disciplines (Kim et al., 2006, Wong, Orengu & Liu, 2007) and identified motives for choice of programmes. Furthermore, the issue of Hospitality and Tourism management study motivation and preference is important to hospitality and tourism academia and industry alike and research into why students study HTM is rather limited. Meanwhile (O’Mahoney, et al., 2001) studies revealed that, Australian students choose HTM studies because of their interest in the hospitality and tourism industry and the influence of their parents and career counsellors. In addition, Zhao (1991) conducted a study and the result demonstrated that Chinese students prefer to enroll on HTM courses because they believe that HTM degrees may lead to respectable careers. Other related studies also revealed students have various motives in selecting of HTM programmes. Five motivational factors were selected for these studies as self-actualization, job opportunity, field of attractiveness, ease of study and academic achievement.

MATERIALS AND METHODS

In order to achieve the objectives of the studies, the researcher used second year students who are currently enrolled on Higher National Diploma programmes (HND) in HTM in Ho Polytechnic and investigated their motives and preference for studying these programmes. The researcher selected these group of students because it was convenient and second year students studying HTM programme best represents the large number of students in the department of Hospitality and Tourism Management in Ho Polytechnic with a class size of (150) students.
Structured questionnaires using 5-point likert scale was administered to the selected group of students. Out of the 150 questionnaires administered 113 was retrieved. The following are the indicator variables used in this study:

**Self-actualization**
- V1 - I like to learn foreign languages.
- V2 - I would like to gain self-actualization.
- V3 - This field suits my area of study.
- V4 - It is possible to contact foreigners and foreign cultures as compared to other fields and make new friends.

**Job opportunity**
- V5 - I believe that this field has a growing potential and I can create my own job.
- V6 - I believe that the percentage of employment is high after graduation.
- V7 - Working in this field apparently looks good.
- V8 - Scenes or pictures of the hospitality industry appearing in movies/TV look attractive.
- V9 - I believe that there are a variety of job opportunities.
- V10 - I believe that this field is practical rather than theoretical.

**HTM jobs are attractive**
- V11 - I live to render services.
- V12 - Jobs in this field look attractive.
- V13 - I would like to study more in this field.
- V14 - I believe that the level salary is high when I secure a job after graduation.
- V15 - I believe that I have many opportunities to take more overseas trips.

**It is easy to study**
- V16 - Compared to other fields, it is easier to pass all subjects.
- V17 - This field was recommended by the descriptive and inferential statistical methods were adopted and the research questions were analyzed accordingly.

Others (parents, friends and teachers)
- V18 - The admission requirement qualified me for this programme.
- V19 - This field provides more job opportunities.

**I want to be a Scholar**
- V20 - I would like to be an expert in both practical and theory.
- V21 - I will like to gain more practical experience to prepare me for work.
- V22 - I would like to be an excellent scholar in this field.

The data was analyzed using Statistical Package for Social Sciences (SPSS). The data analysis was presented in two parts including descriptive analysis (presented in the form of tables) and exploratory analysis (using factor analysis and t-test: paired two sample means for making inferences and drawing conclusions of the study. These tests were carried out to find out the major motivational factors and preference for studying HTM programmes and to compare motivational factors of male and female HTM students.
RESULTS

Table 1 shows age and gender distribution of respondents involved in the study. A total of 20 male and 93 female students took part in this study corresponding to 17.7% and 82.3% respectively. Table 2 on the other hand shows the distribution of the respondents in terms of programmes they are undertaking.

Table 1: Age and Gender distribution of respondents

<table>
<thead>
<tr>
<th>Age</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20 yrs</td>
<td>4</td>
<td>9</td>
<td>13</td>
<td>11.50</td>
</tr>
<tr>
<td>20-29 yrs</td>
<td>15</td>
<td>75</td>
<td>90</td>
<td>79.65</td>
</tr>
<tr>
<td>30 yrs &amp; above</td>
<td>1</td>
<td>9</td>
<td>10</td>
<td>8.85</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>93</td>
<td>113</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 2: Qualification of Respondents

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSCE/WASSCE</td>
<td>53</td>
<td>46.9</td>
</tr>
<tr>
<td>Cookery Part 2</td>
<td>48</td>
<td>42.5</td>
</tr>
<tr>
<td>Diploma Certificate</td>
<td>10</td>
<td>8.8</td>
</tr>
<tr>
<td>GCE O' Level/Teacher training certificate</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Total</td>
<td>113</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Tables 3 and 4 show Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett’s Test of sphericity. While Figure 1 shows the Eigen Value against number of components.
Table 3: KMO and Bartlett’s Test

<table>
<thead>
<tr>
<th>Kaiser-Meyer-Olkin Measure of Sampling Adequacy</th>
<th>.842</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bartlett’s Test of Sphericity</td>
<td></td>
</tr>
<tr>
<td>Approx. Chi-Square</td>
<td>1.200E3</td>
</tr>
<tr>
<td>df</td>
<td>231</td>
</tr>
<tr>
<td>Sig.</td>
<td>.000</td>
</tr>
</tbody>
</table>

Table 4: Total Variance Explained

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigen values</th>
<th>Total</th>
<th>% of Variance</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.631</td>
<td>33.944</td>
<td>33.944</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.167</td>
<td>10.911</td>
<td>44.855</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.774</td>
<td>7.24</td>
<td>52.095</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.636</td>
<td>5.949</td>
<td>58.044</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.619</td>
<td>5.782</td>
<td>63.826</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.525</td>
<td>4.909</td>
<td>68.735</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Eigen Value against number of components
### Table 5: Rotated Factor Matrix

<table>
<thead>
<tr>
<th>Variables</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
<th>Component 5</th>
<th>Component 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>V10</td>
<td>0.603</td>
<td>0.136</td>
<td>-0.029</td>
<td>0.037</td>
<td>-0.001</td>
<td>-0.128</td>
</tr>
<tr>
<td>V22</td>
<td>0.337</td>
<td>0.037</td>
<td>0.09</td>
<td>0.03</td>
<td>-0.069</td>
<td>-0.05</td>
</tr>
<tr>
<td>V20</td>
<td>0.344</td>
<td>0.16</td>
<td>0.087</td>
<td>0.119</td>
<td>0.002</td>
<td>-0.027</td>
</tr>
<tr>
<td>V19</td>
<td>0.361</td>
<td>0.01</td>
<td>0.129</td>
<td>0.114</td>
<td>-0.025</td>
<td>0.079</td>
</tr>
<tr>
<td>V21</td>
<td>0.355</td>
<td>0.169</td>
<td>0.049</td>
<td>0.006</td>
<td>0.01</td>
<td>0.045</td>
</tr>
<tr>
<td>V7</td>
<td>0.437</td>
<td>0.24</td>
<td>0.081</td>
<td>0.356</td>
<td>0.017</td>
<td>-0.015</td>
</tr>
<tr>
<td>V5</td>
<td>0.405</td>
<td>0.395</td>
<td>0.147</td>
<td>0.297</td>
<td>-0.06</td>
<td>-0.112</td>
</tr>
<tr>
<td>V18</td>
<td>0.379</td>
<td>-0.036</td>
<td>0.309</td>
<td>0.209</td>
<td>-0.022</td>
<td>-0.067</td>
</tr>
<tr>
<td>V11</td>
<td>0.29</td>
<td>0.091</td>
<td>0.109</td>
<td>0.14</td>
<td>-0.119</td>
<td>0.211</td>
</tr>
<tr>
<td>V8</td>
<td>0.252</td>
<td>0.141</td>
<td>0.115</td>
<td>0.22</td>
<td>0.092</td>
<td>0.052</td>
</tr>
<tr>
<td>V2</td>
<td>0.012</td>
<td>0.448</td>
<td>0.06</td>
<td>0.1</td>
<td>-0.095</td>
<td>0.072</td>
</tr>
<tr>
<td>V3</td>
<td>0.298</td>
<td>0.445</td>
<td>-0.058</td>
<td>0.045</td>
<td>-0.013</td>
<td>-0.034</td>
</tr>
<tr>
<td>V4</td>
<td>0.082</td>
<td>0.454</td>
<td>0.306</td>
<td>0.119</td>
<td>-0.018</td>
<td>-0.08</td>
</tr>
<tr>
<td>V1</td>
<td>0.203</td>
<td>0.343</td>
<td>0.164</td>
<td>-0.008</td>
<td>-0.044</td>
<td>-0.106</td>
</tr>
<tr>
<td>V14</td>
<td>-0.014</td>
<td>0.231</td>
<td>0.65</td>
<td>0.057</td>
<td>0.104</td>
<td>0.04</td>
</tr>
<tr>
<td>V15</td>
<td>0.231</td>
<td>0.053</td>
<td>0.417</td>
<td>0.173</td>
<td>-0.108</td>
<td>0.044</td>
</tr>
<tr>
<td>V13</td>
<td>0.31</td>
<td>0.012</td>
<td>0.336</td>
<td>-0.048</td>
<td>-0.266</td>
<td>0.014</td>
</tr>
<tr>
<td>V12</td>
<td>0.193</td>
<td>0.103</td>
<td>0.232</td>
<td>0.147</td>
<td>-0.026</td>
<td>0.035</td>
</tr>
<tr>
<td>V6</td>
<td>0.103</td>
<td>0.099</td>
<td>0.139</td>
<td>0.8</td>
<td>-0.067</td>
<td>0.009</td>
</tr>
<tr>
<td>V9</td>
<td>0.327</td>
<td>0.27</td>
<td>0.112</td>
<td>0.328</td>
<td>-0.006</td>
<td>-0.046</td>
</tr>
<tr>
<td>V17</td>
<td>-0.027</td>
<td>-0.169</td>
<td>-0.012</td>
<td>-0.055</td>
<td>0.901</td>
<td>0.143</td>
</tr>
<tr>
<td>V16</td>
<td>-0.077</td>
<td>-0.092</td>
<td>0.034</td>
<td>-0.027</td>
<td>0.155</td>
<td>0.872</td>
</tr>
</tbody>
</table>

### Table 6: Unrotated Factor Matrix

<table>
<thead>
<tr>
<th>Variables</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
<th>Component 5</th>
<th>Component 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>V5</td>
<td>.649</td>
<td>-.047</td>
<td>.082</td>
<td>-.073</td>
<td>-.025</td>
<td>.095</td>
</tr>
<tr>
<td>V7</td>
<td>.579</td>
<td>.082</td>
<td>.140</td>
<td>.008</td>
<td>-.140</td>
<td>.037</td>
</tr>
<tr>
<td>V9</td>
<td>.527</td>
<td>.039</td>
<td>.071</td>
<td>-.066</td>
<td>-.106</td>
<td>.051</td>
</tr>
<tr>
<td>V20</td>
<td>.385</td>
<td>.029</td>
<td>.113</td>
<td>.062</td>
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<td>.006</td>
</tr>
<tr>
<td>V18</td>
<td>.447</td>
<td>.082</td>
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<td>.068</td>
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</tr>
<tr>
<td>V1</td>
<td>.367</td>
<td>-.087</td>
<td>.014</td>
<td>-.076</td>
<td>.200</td>
<td>.108</td>
</tr>
<tr>
<td>V3</td>
<td>.404</td>
<td>-.071</td>
<td>.159</td>
<td>-.010</td>
<td>.089</td>
<td>.304</td>
</tr>
<tr>
<td>V15</td>
<td>.420</td>
<td>.103</td>
<td>-.207</td>
<td>.032</td>
<td>.066</td>
<td>-.195</td>
</tr>
<tr>
<td>V22</td>
<td>.299</td>
<td>-.034</td>
<td>.090</td>
<td>.152</td>
<td>.053</td>
<td>-.083</td>
</tr>
<tr>
<td>V10</td>
<td>.473</td>
<td>-.067</td>
<td>.346</td>
<td>.220</td>
<td>.063</td>
<td>-.021</td>
</tr>
</tbody>
</table>
### DISCUSSION AND CONCLUSIONS

The studies investigate student’s motivation and preference of studying hospitality and tourism management programmes in Ho Polytechnic. Five motivational factors were identified with 22 motivational statements. One hundred thirteen (113) respondents were selected for the study in the age group of 20 – 29 years being females with the modal class of 79.65% whilst 30 years and above recorded the least number of respondents who participated in the research.

The qualification of respondents who participated in the study ranges from Senior Secondary and West Africa Senior High Certificate in home economics and cookery Part one and two representing 53 (46.9%) and 48 (42.5%) respectively. This shows that, most of the respondents have relevance background and therefore has provided reliable information on the topic under discussion.

In examining student’s motivation and preference using descriptive statistics, the

### Table 7: t-Test Paired Two Sample Mean

<table>
<thead>
<tr>
<th></th>
<th>Men's mean</th>
<th>Women's mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.567</td>
<td>2.650</td>
</tr>
<tr>
<td>Variance</td>
<td>0.072</td>
<td>0.100</td>
</tr>
<tr>
<td>Observations</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>0.990</td>
<td></td>
</tr>
<tr>
<td>Hypothesized Mean Difference</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>t Stat</td>
<td>-6.110</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) one-tail</td>
<td>2.3E-06</td>
<td></td>
</tr>
<tr>
<td>t Critical one-tail</td>
<td>1.721</td>
<td></td>
</tr>
<tr>
<td>P(T&lt;=t) two-tail</td>
<td>4.61E-06</td>
<td></td>
</tr>
<tr>
<td>t Critical two-tail</td>
<td>2.080</td>
<td></td>
</tr>
</tbody>
</table>
results revealed that (V22, V20 and V19) thus (excellent scholar, job opportunities, expert in both practical and theory) recorded high mean values for some indicator variables. A standard deviations of around 0.5 shows that there are no wide variations between the original factors. Another set of variables in the outputs are V16 and V17. They are very conspicuous and have the lowest mean values and approximately the same standard deviations. Their mean value around 2 implies that these factors might have recorded a lot of ‘neutral’ responses by the students.

Secondly, the results from the KMO value of 0.84 shows that the test is meritoriously adequate and hence factor analysis can be used to select the salient’s variables (motivational factors). This suggests that, correlation matrix is appropriate for factoring. The Bartlett’s test of sphericity is also highly significant with a P – value of 0.00 at a large chi-square value of 1200. In addition results also revealed that, out of the 22 original indicator variables only two have Eigen values significantly greater than one. Four of the Eigen values though less than one are significant. The screen plot diagram also confirms the significance of the first component in explaining the differences that exists among the motivational factors and preference of enrolling on HTM Programmes between men and women. The elbow occurs at the 6th component. This means that the number of factors to be considered cannot exceed six.

Moreover, on the issue of job opportunities the results revealed that, the unrotated factor matrix gives clues to the interpretability of the underlying factors that seeks to explain the motivation and preference of HTM Programmes among students of Ho Polytechnic. At a cut-off value of 0.5, it can be seen that the first factor is highly loaded on V5, V6, V7, V9 and V10. This suggests that, job opportunity is the first factor that described a dominant trend in relation to motivation and preference among the respondents. The second and third factor is distinctively loaded highly on V16 and V17. This factor is related to ease of study nature of the HTM Programme.

Furthermore, results also revealed that, after rotation, it was observed that factor one now loads highly on V10. A closer look at the mean of this factor showed a value 2.53 which indicated that most of the respondents were undecided (neutral). Hence the first factor reflects the job opportunity behaviour of the students.

On the issue of self-actualization the results revealed that, the factor has high significant loadings on V2, V3, and V4. From the descriptive statistics table V2, V3 and V4 have high mean values of 2.71, 2.66, and 2.52 respectively. These depict the high level of importance attached to them by the respondents with their respective standard deviations of 0.59, 0.65 and 0.74. Factor three loads highly on V14. On the contrary this factor does not necessarily motivate students towards HTM Programmes. The next factor also loads high on V6. This has a mean value of 2.25 suggesting that most of the respondents disagreed or the response was neutral.

Furthermore, on the issue of ease of study, the results revealed an overwhelming high loading on V17 and V16 respectively. These suggest that, the factors are specifically based on the high level of importance attached to them. They recorded the lowest mean values of 1.84 and 1.88 with their respective standard deviations of 0.91 and 0.95.

Finally to show the comparison between male and female factors hypothesis was formulated below:
H₀: The mean motivational factors of female are the same as the mean motivational factors and preference of male.

H₁: The mean motivational factors and preference of females and males differ.

The output results revealed that, the test is a one-tailed with a test statistic of – 6.10 which is less than the critical value of – 1.72 and so might call for the rejection of the null hypothesis. The P – value for one – tail is 2.31 which fall into the rejection region and so the test is quite significant and supports the rejection of the null hypothesis. Therefore the argument is that, 95% of the time, there is enough evidence to infer that the motivational factors and preference of females are always different from that of their male counterpart.

Hospitality and tourism educations is very dear to the country Ghana because of the immense contribution of the tourism sector to the economic development of the country. The results of the study revealed that, job opportunity is the first most important rated by students as motivational factor, followed by parental influence, other factors, self-actualization, scholastic achievement, field attractiveness and ease of study. This trend of affairs is worrying because students do not understand the concept of Polytechnic education which is training of highly skilled and competent manpower imbued with entrepreneurial skills to enable them to be job creators but not white collar job seekers. The implication is that if these students are not educated on the choice of selecting programmes in tertiary institution before completing Senior High Schools, parental influences and other influential factors may enable them to opt for programmes that they may not be interested in. They may end up not being in the right profession and thereby educational policies will only remain on paper. Considering the rate at which the hospitality and tourism sector is advancing there will a possibility of shortfall of skills in the hospitality and tourism sector in the near future.

The results of the study will provide constructive information for policy makers of hospitality and tourism education in Ghana. Secondly, course units should be strengthened in Senior High schools and Polytechnics. Finally, the measurement items used for this study could be adopted to examine a study motivation and preference in other major disciplines in Polytechnics in Ghana. It may be useful to replicate the study in other Polytechnics or tourism related institutions in Ghana.
REFERENCES


Hjalager A (2003). Global Tourism careers: Opportunities and dilemmas facing higher education in tourism, Journal of Hospitality, leisure, Sport and Tourism Education 2: 26-


Streamlining TVET System for Entrepreneurship Development: the case of the Transport Industry in Tanzania

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ABSTRACT

This paper pinpoints the importance of entrepreneurship knowledge in Technical and Vocational Education & Training (TVET) system, with special reference to the Tanzanian transport industry. Entrepreneurship in the transport industry serves the country by moving goods and services from one place to another in an effective and efficient way. However, most TVET graduates are lagging behind in undertaking ventures in this industry. The methodology adopted in this paper involves systematic review of the profiles of existing entrepreneurs in the transport industry in order to determine their entrepreneurship education status with reference to TVET system. The current situation reveals that there is a deficiency in the Tanzanian TVET system with regard to entrepreneurship education since the majority of the respondents did not possess TVET education. It is therefore recommended that there is need to streamline the TVET system with effective curriculum for entrepreneurship development.

Key words: Entrepreneurship, Development, TVET, Transport, Industry

INTRODUCTION

Entrepreneurship is a key component for the success of the economy of any country. A civilized and modest society has at some point applied the principles of entrepreneurship in its development process. There is no doubt that the knowledge of entrepreneurship can be applied in all works of life, from government departments, parastatals, NGO’s, farmers, arts and other pursuits (Rwigema and Venter, 2004). Entrepreneurship has a social and economic impact in job creation, education, government and parastatals, NGO’s, arts and culture, and political parties. Governments, businesses and individuals are operating in an increasingly globalized and competitive environment; and survival depends on people who are driven by opportunity and who seek to maximize their goals in a sustainable way.

Entrepreneurship has been considered as a last resort to many Tanzanians, especially those who have had an opportunity to attend formal education. Unfortunately, the market is not ready to employ all people graduating each year, and because of unemployment some formal education graduates are forced into informal trading where they gradually grow into business people. From this group, accidental entrepreneurs have forged resilient business some competing internationally. This
situation is not unique to Tanzania as many African countries are facing high unemployment rate. Apparently many people in Africa have an incorrect ideology with regard to entrepreneurship. Many believe that people are born entrepreneurs or only genius people can become entrepreneurs (Kurotko & Hodgetts, 2004). However, entrepreneurship is a process and includes innovation and creativity. Both innovation and creativity can be learnt, developed and improved. Innovation enables entrepreneurs to convert opportunities into marketable ideas that result into improved efficiency or effectiveness of a system. It is also acknowledged that everyone is creative to some extent and some people may be more creative than others. Evidently, many people in developed countries have been raised and educated in an environment that encourages them to develop their creativity, and therefore, entrepreneurship skills. They have been taught to think and act creatively. This is not so among Africans. and the creative process seems more difficult because of our cultural and educational background. If we are to be creative we need to learn on how to implement the creative process (Kurotko and Hodgetts, 2004). Technical and Vocational Education and Training (TVET) has a major role to play in entrepreneurship development. TVET system needs to be considered as an important tool for imparting entrepreneurship skills to TVET participants. TVET system needs to be sufficient enough to achieve this objective.

The aim of this paper is to assess the effectiveness of TVET system in imparting entrepreneurship skills to students and show the need to streamline the TVET system with effective curricula for entrepreneurship development. An insight of the transport industry in Tanzania has been used as model and it can be applied in other related sectors of the economy. The transport industry in Tanzania is comprised of five modes: road, railway, air, water and pipeline. The road, railway and pipeline require transport infrastructure, while there is no transport infrastructure for the air and water but airports and seaports. 90 per cent of infrastructure is provided by the government and who is also the sole owner of transport infrastructure. Transport operations are mainly dominated by private investors. For example, the road transport is completely operated by the private sector with the government playing the regulatory role. This is also common in the airline industry, where private investors dominate the industry with only one airline owned by the government. The government owns and operates the TAZAMA pipeline together with the government of Zambia and the Songosongo pipeline.

Transport and infrastructure development are major components of the country’s economy. Improving the business environment has been the key issue by the government and the private sector. The General Budget Support (GBS) reviews reported subsequent deteriorating ranks by the government in the World Bank’s Doing Business report 2011. The drop was attributed to the worsening ranking in five areas including deteriorating ranks in starting a business and trading across borders. The competitiveness of the country is also sliding for example, in the 2010/2011. Global Competitive Index, Tanzania ranked 113th having slide by nine position from the previous year. Among key factors to the decline are underdeveloped infrastructure particularly in energy and transport, low human capital development, unsatisfactory regulatory and legal environment, and poor human resource base. Improved infrastructure should not be treated in isolation. Improved transport operation has impact in the business environment and other sectors of the economy. The transport industry needs professionals to operate the transport infrastructure. The industry is dominated
by uneducated, non-professionals and therefore it is available for entrepreneurs. Professional entrepreneurs are required for effective and efficient transport operations and therefore initiating and sustaining the economy of this country (Khan, Arif and Ali, 2005). The importance of transport business is rising day by day and the transport sector contributes highly to the economy of the country. The performance of agriculture, natural resources and manufacturing sectors will not be realized without reliable, affordable, and accessible transport operations. Transport supports all other social and economic activities. The benefits of cross border trade cannot be realized without innovative and creative transport operators. Transport operators should be equipped with entrepreneurial skills for the benefits of transport to be realized.

**MATERIALS AND METHODS**

The methodology involved systematic review of the profiles of existing entrepreneurs in the transport industry in order to determine their entrepreneurship education status with reference to TVET system. The survey included 10 companies involved in transport business. A combination of survey methods was used for the survey including desk study, online information and interviews.

**RESULTS**

**Opportunities in the transport industry**

The transport industry in Tanzania presents many opportunities for entrepreneurs; roads, railways, inland waterways, seaports, maritime shipping and civil aviation catering for both domestic and international traffic. The Tanzania transport sector plays a crucial role in the growth of the Tanzanian economy; it facilitates domestic and international trade, contributes to national integration, and provides access to jobs, health, education and other essential facilities. The transport system’s effectiveness, appropriateness and adequacy contribute a great deal to the successful implementation of socioeconomic activities, the lowering of domestic production costs through timely delivery, and the enhancement of the economies of scale in the production process and creating economic opportunities. In the past five years, the transport sector in Tanzania has helped to integrate market- strengthening competition, increase access to farming techniques, promote trade, tourism, and foreign investment, and has contributed to the government revenue (Table 1 and 2). Furthermore, Tanzania serves as a transit country for the import and export route for goods destined to Malawi, Zambia, DR
Congo, Burundi, Rwanda and Uganda, 2). using the port of Dar es Salaam (Figure 1 &

**Table 3**: The contribution of transport industry to the economy as revealed in Revenue Collection - 2010/11

<table>
<thead>
<tr>
<th>DEPARTMENT</th>
<th>October</th>
<th>November</th>
<th>December</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Revenue</td>
<td>72,191.4</td>
<td>74,462.3</td>
<td>108,863.8</td>
<td>255,517.6</td>
</tr>
<tr>
<td>Customs and Excise</td>
<td>184,314.3</td>
<td>204,750.3</td>
<td>207,537.0</td>
<td>596,601.6</td>
</tr>
<tr>
<td>Large Taxpayers</td>
<td>146,387.2</td>
<td>140,745.8</td>
<td>268,050.3</td>
<td>555,183.3</td>
</tr>
<tr>
<td>TOTAL (GROSS)</td>
<td>402,893.0</td>
<td>419,958.4</td>
<td>584,451.1</td>
<td>1,407,302.5</td>
</tr>
</tbody>
</table>

Source: Tanzania Revenue Authority

**Table 4**: The contribution of the transport industry in the National income tax

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P.A.Y.E.</td>
<td>408,611.6</td>
<td>512,177.1</td>
<td>662,271.4</td>
<td>743,353.3</td>
<td>928,468.9</td>
</tr>
<tr>
<td>Corporation Tax</td>
<td>267,230.9</td>
<td>374,640.1</td>
<td>414,731.8</td>
<td>418,268.2</td>
<td>537,561.6</td>
</tr>
<tr>
<td>Individuals</td>
<td>31,174.2</td>
<td>36,306.8</td>
<td>42,109.7</td>
<td>48,632.0</td>
<td>58,402.8</td>
</tr>
<tr>
<td>Other Income Taxes</td>
<td>146,483.5</td>
<td>182,625.1</td>
<td>230,735.2</td>
<td>287,721.3</td>
<td>315,495.9</td>
</tr>
<tr>
<td>Domestic Excises duty</td>
<td>175,955.0</td>
<td>220,616.0</td>
<td>286,728.5</td>
<td>303,826.5</td>
<td>353,735.6</td>
</tr>
<tr>
<td>Domestic VAT</td>
<td>421,252.7</td>
<td>550,080.5</td>
<td>692,561.1</td>
<td>727,797.4</td>
<td>798,377.8</td>
</tr>
<tr>
<td>Other Domestic Taxes &amp; Charges</td>
<td>36,329.8</td>
<td>73,996.1</td>
<td>83,768.2</td>
<td>97,397.2</td>
<td>136,099.4</td>
</tr>
<tr>
<td>Import duty</td>
<td>245,477.9</td>
<td>304,477.1</td>
<td>373,948.5</td>
<td>383,329.5</td>
<td>489,010.5</td>
</tr>
<tr>
<td>Excises duty on Import</td>
<td>311,984.6</td>
<td>440,301.2</td>
<td>475,254.1</td>
<td>533,795.5</td>
<td>614,293.4</td>
</tr>
<tr>
<td>VAT on Import</td>
<td>463,753.2</td>
<td>550,066.0</td>
<td>641,378.0</td>
<td>759,396.5</td>
<td>905,610.8</td>
</tr>
<tr>
<td>Other Import charges</td>
<td>111,235.5</td>
<td>220,549.3</td>
<td>258,144.4</td>
<td>266,911.8</td>
<td>327,450.5</td>
</tr>
<tr>
<td>TOTAL (GROSS)</td>
<td>2,619,488.7</td>
<td>3,465,835.3</td>
<td>4,161,630.9</td>
<td>4,570,429.2</td>
<td>5,464,507.1</td>
</tr>
</tbody>
</table>

Source: Tanzania Revenue Authority
Railway transport

Tanzania’s railways have a total track length of 3,676km, which are operated by two railway systems: the Tanzania Railway Corporation (TRC) for 2,706 km and Tanzania-Zambia Railway (TAZARA) for 970 km. Railway transport has not been performing well recently. It has faced several important infrastructural problems, as well as stiff competition from road transport and the poor performance of the economies of the neighboring landlocked countries. This has led to a deterioration of its network assets and capability to provide a reliable and constant service.

The figures below show the declining trend in the availability of rail locomotives and wagon availability for a period between 2007/08 and 2008/09. There are some explanations for the decline; accidents, and poor maintenance policy. This presents an opportunity for private investors in the infrastructure and operations as well.
Figure 3: Locomotive availability for 2007/08 and 2008/2009

Figure 4: Number of available wagons for 2007/08 and 2008/09

**Road transport**

The geography of Tanzania, including its size, diversity and dispersion, give roads a special position in the integration of the national economy. In particular, roads serve rural areas, where the majority of the people live, more effectively than any other mode of transport. Road transport presents a major market share of total transport sector and it needs huge investment. The current Tanzania Road Network length is about 85,000 km, which includes trunk and regional roads (35,000 km) managed by the Tanzania National Roads Agency
(TANROADS), and the urban, district and feeder roads with a total of 50,000 km, managed by Local Government Authorities (LGA). A lot of problems, opportunities and entrepreneurial innovations emerge in this sector. The table below depicts an increasing trend in passenger vehicle registration since 2006. The major innovation has been the ban of vehicles with carrying capacity of less than 25 passengers the situation contributed to large buses increase in 2010 and declining small buses. The area is open for investment for infrastructure and operations. Table 5: Number of licensed urban buses by size - Dar es Salaam region

### Table 4: Volume of Road transport, 2006-2010

<table>
<thead>
<tr>
<th>Date</th>
<th>Large Buses (25+ Passengers)</th>
<th>Small Buses (Up to 24 Passengers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2006</td>
<td>1,273</td>
<td>3,382</td>
</tr>
<tr>
<td>March 2008</td>
<td>1,773</td>
<td>3,011</td>
</tr>
<tr>
<td>August 2008</td>
<td>2,002</td>
<td>2,978</td>
</tr>
<tr>
<td>April 2009</td>
<td>2,617</td>
<td>2,474</td>
</tr>
<tr>
<td>June 2009</td>
<td>2,779</td>
<td>2,212</td>
</tr>
<tr>
<td>June 2010</td>
<td>4,182</td>
<td>1,747</td>
</tr>
</tbody>
</table>

Source: [Source: Ministry of Education and Vocational Training](#)
Marine transport
Tanzania maritime transport revolves around its major sea ports, which are Dar es Salaam, Tanga and Mtwara, all managed and operated by Tanzania Ports Authority (TPA). The inland water transport, with ports in Lakes Victoria, Tanganyika and Nyasa, is managed by Marine Service Company. Smaller ports are Kilwa, Lindi, Mafia, Pangani and Bagamoyo. Dar es Salaam is the principle port of Tanzania with an annual throughput of 7 million tons handling about 93% of Tanzania’s port traffic and is recognized as one of Africa’s most productive ports. It is a major sea outlet for the Republic of Zambia, Burundi, Malawi, Rwanda, Uganda, Zimbabwe, and eastern parts of the Democratic Republic of the Congo.

The port also serves as a convenient freight linkage to the Middle and Far East, Europe, Australia and America. The marine transport sub-sector as a whole, however, remains characterized by poor performance. The dwell time and berth occupancy are also high (Figure 8, 9&10). These problems are attributed by the following factors:

- Poor performance of administrative services such as customs procedures and other mandatory inspections
- Poor coordination between importers and exporters; and
- Poor surface modes of transport for off-take purposes

Figure 5: Average monthly dwell time for import full containers - Dar es Salaam Port
Figure 6: Trend in berth occupancy rate at container terminal - Dar es Salaam Port

Figure 7: Performance of container terminal; waiting time, service time and turn round time

There are also inland waterways ports which are used to transport cargo and passengers inland as well as between neighbouring countries. They are presently 16 operating vessels on lakes
including Mwanza, Kemondo Bay, Itungi on Lake Nyasa; and Kigoma on Lake Tanganyika.

**Air transport**

Tanzania has four international airports in Dar es Salaam, Zanzibar, Kilimanjaro, and Mwanza. Strategic airports include: Arusha, Lake Manyara, Mafia and Ngara. Major domestic airports: Mtwara, Dodoma, Kigoma, Tabora, Mbeya, Songwe, Songea, Lindi, Shinyanga, Musoma, Bukoba, Sumbawanga, Tanga and Lake Manyara and small airports. The national airline, Air Tanzania Company Limited (ATCL) is the major provider of domestic air travel linking all major towns in the country. Private companies have also started operating, and the number of registered airways and charter companies in the country has been increasing year after year. This has led to a very competitive sub-sector where many new players are coming to the market and others exiting the market because of competition. The area is open for entrepreneurs capable of withstanding the competitive pressure.

**Pipeline transport**

Pipeline system consists of 1750 km used to transport crude oil products from Dar es Salaam to Ndola refinery in Zambia (TAZAMA). 232 km are used to transport natural gas from Songosongo, Mbeya to Dar es Salaam.

**Challenges in Technical Expertise**

In 2011, TVET institutions totaled 1170. Despite the well articulated policies, the problem of unemployment remains very conspicuous (Figure 3). The number of graduates every year is worrisome and goes beyond the available job opportunities (Figure 4 and 5).

![Tanzania Unemployment Rate from 2002 to 2011](Source: Ministry of Education and Vocational Training).

**Figure 8:** Tanzania unemployment rate from 2002 to 2011
Figure 9: Folk and Vocational Education and Training - enrolled and graduated 2008/09 to 2010/10

Figure 10: Technical Education and Training- enrolled and graduated 2010/11

Survey of Entrepreneurship Education in the Tanzania Transport Industry
The results from the survey reveal the situation in the transport industry with regard to entrepreneurship education. From the study findings it is revealed that most operators possess secondary education (Table 3). Only 30 per cent operators have attended TVET education and most of them with certificate level. Only 10 per cent of
operators possess to the Masters level education, and fortunately with knowledge related to the industry. The company was very successful in terms of strategy and mission and it had been able to achieve its objective since its inception. The company was a result of corporate spin-offs it came into existence after the dis-investment of another company.

The results also indicate that most company owners are independent and they came about as a result of profit motive and poor pay from previous employments. Besides, 30 per cent of operators have been phased out within the period of 20 years. The most cited reasons for the fall are capital, legal restrictions and lack of industry related training. Other factors have been outlined in the table below. It was reported that the Tanzania Revenue Authority (TRA) and Surface and Marine Transport Regulatory Authority (SUMATRA) possess what they call ‘stringent’ regulations on the registration of transport companies. As a result many people interested with investing in the transport industry, they end up forging the required documents and certificates for registering their companies. Some of them use another people with relevant training to sit in their place for examinations administered by TRA.

Table 5: Business Establishments in Tanzania Transport Industry (1990-2012)

<table>
<thead>
<tr>
<th>Survey attribute</th>
<th>Percentage (%)</th>
<th>Survey attribute</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of establishment</td>
<td></td>
<td>Type of education</td>
<td></td>
</tr>
<tr>
<td>1990-2000</td>
<td>20</td>
<td>Technical and Vocational</td>
<td>30</td>
</tr>
<tr>
<td>2001-2010</td>
<td>80</td>
<td>Higher education</td>
<td>10</td>
</tr>
<tr>
<td>2011-to-date</td>
<td>0</td>
<td>Other(s) such as secondary</td>
<td>60</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>Total</td>
<td>100</td>
</tr>
<tr>
<td>Type of business</td>
<td></td>
<td>Reasons for starting a</td>
<td></td>
</tr>
<tr>
<td>Passenger transport (road)</td>
<td>20</td>
<td>business</td>
<td></td>
</tr>
<tr>
<td>Cargo transport (road)</td>
<td>20</td>
<td>Profit motive</td>
<td>60</td>
</tr>
<tr>
<td>Cargo Clearing and</td>
<td></td>
<td>Challenge</td>
<td>-</td>
</tr>
<tr>
<td>forwarding</td>
<td>60</td>
<td>Desire for independence</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>Total</td>
<td>100</td>
</tr>
<tr>
<td>Ownership of the company</td>
<td></td>
<td>Factors outlined as</td>
<td></td>
</tr>
<tr>
<td>Independent</td>
<td>70</td>
<td>challenges for</td>
<td></td>
</tr>
<tr>
<td>Corporate spinoffs</td>
<td>10</td>
<td>transport entrepreneurs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capital</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>High interest rates</td>
<td></td>
</tr>
</tbody>
</table>
Olomi (2008) asserted that it is very usual in Tanzania to find graduates staying many years unemployed, doing nothing or walking around on streets searching for jobs. Many people also argue that graduated in Tanzania could be self-employed but the main problem is that they are not psychologically and functionally prepared to think of opportunities related to their professions (Al-Samarai & Paul, 2003; Gibb & Hannon, 2006; Olomi 2006). The curriculum has been structured in a traditional way just to meet the current demands and job requirement. In other words the developed curricula are not sufficient to impart the relevant entrepreneurial skills to students in required fields. Most curricula are not flexible and have been developed to incorporate entrepreneurial subjects but not necessarily delivering the required skills in respective fields of study (European Commission, 2008).

<table>
<thead>
<tr>
<th>Level of education</th>
<th>Entrepreneurs</th>
<th>Total</th>
<th>High business risk</th>
<th>Legal restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary education</td>
<td>40</td>
<td>100</td>
<td>Lack of training</td>
<td>Lack of industry experience</td>
</tr>
<tr>
<td>Certificate</td>
<td>30</td>
<td></td>
<td>Insufficient local skills</td>
<td></td>
</tr>
<tr>
<td>Diploma</td>
<td>20</td>
<td></td>
<td>Threat of competition</td>
<td></td>
</tr>
<tr>
<td>Higher diploma</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masters</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doctorate</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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**DISCUSSION AND CONCLUSIONS**

**Tanzania TVET policy and entrepreneurship**

The role of education in the developmental effort of any nation need not be underestimated (Garba, 2010). The development of the educational sector is a prerequisite for the development in all other sectors of the economy. It is further asserted that is a prerequisite for the development in all other sectors of the economy. It is a sure pathway to liberalization of the mind and the improvement of social economic status of people (Sule, 2004). Various governments and international agencies are making serious effort to optimally develop the education sector. A number of achievements have been recorded in this regard, however much effort is required to meet up with the ever increasing demands of the present and the future challenges (Garba, 2010; Fayole, 2006).
Technical and Vocational Training and Education (TVET) runs across all sectors of social and economic development. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 1989) and International Labour Organization (ILO) TVET has a role to play in architecture, journalism, agriculture, fishing, accounts, water, hotel, minerals, natural resources, pilot, transport, law and many more. It includes all professions of engineering, science, technology, metal crafts, seamanship, arts and culture, etc. Historically, TVET in Tanzania started before colonialism. It was part of the traditions of almost all tribes in Tanzania. Every village possessed craftsmen for various equipment such as knives, boats, hoes, fish nets, beds and so on. Colonialism diminished the importance of TVET, giving importance to formal education particularly the Primary education. TVET education was provided to students with poor performance who would otherwise not continue with secondary education. This underscored the importance of TVET to many students and the society in turn. However, in 1940 the Apprenticeship Ordinance; Cap 81 revived the importance of technical education by training some people for working in plantations and small colonial industries.

Improved infrastructure is a prerequisite in the development of this country. The government needs to continuously invest in infrastructure development and whenever possible encourage the participation of the private sector in infrastructure development. It is also understood that the interest of the government and the private sector differs in most cases. While the government seeks to maximize the social welfare of its people, private investors are seeking to maximize their profit. However, this should not be an obstacle to infrastructure development it should rather be addresses as a challenge. The government should seek ways to harmonize its interest without neglecting the interest of the private investors. The government should consider using different infrastructure investment schemes such as PPT, BOT, BOOT, among others. Lack of seriousness in infrastructure development is jeopardizing the economy of Tanzania, and therefore the lives of its people. This paper however, focuses on the role of entrepreneurship education in transport operations.

In 1948, after World War II a crafts center was set at Mgulani, Dar es Salaam for the purpose of providing short term training in sewing and tailoring, shoe craft, carpentry, and mechanics. Subsequently, technical schools such as Ifunda Trade School, Moshi Trade School and Dar es Salaam Technical Institute currently Dar es Salaam Institute of Technology, started. Since independence, technical education has been managed and coordinated through different ministries. From 1961 to 1972 it was under the ministry of Labour, Communication and Works, Ministry of Labour and Social Welfare – 1972 to 1975, Ministry of Labour and Manpower Development – 1975 to 1987, Ministry of Labour, Youth Development and Sports – 1987 to

In 1974 the National Vocational Training and Advisory Council (NVTAC) was formed for the purpose of ensuring sufficient human resource in all sectors of the economy with special consideration to industries. The council was also responsible for managing all technical and vocational institutes. This council was succeeded by the Vocational Education and Training policy Paper and in 1995 the Vocational Education and Training Authority (VETA) was formed. In 1996 the National Technical Council for Technical Education (NACTE) was formed by the National Technical Training and Advisory Council (NATTACC) of 1979. From 1995 there was no government department involved with technical and vocational training. This situation led to the formation of Technical and Vocational Education and Training (TVET) department under the Ministry of Education and Vocational Training. There are three Sections of TVET Department: Technical Education and Training (TET) Section; Vocational Education and Training (VET) Section; and Management Support Section.

From the above facts, it is realized that teaching entrepreneurship as a subject within a broad range of other subjects is not sufficient. The curricula should be developed in a way that entrepreneurship skills are reflected through the entire study. The courses are not to be too theoretical they should rather include relevant practical skills of innovation and creativity to enable graduates to explore various opportunities related to their professions immediately after graduation (Al-Samarai & Paul, 2003). Thus, there is a need for new approaches necessary to deliver entrepreneurial graduates in different sectors of the economy capable of exploring developmental challenges around them.

The aim of this paper was to pinpoint the role of entrepreneurship education in transport operations and to highlight the need of streamlining TVET system for entrepreneurship development. It is clearly indicated that the Tanzania TVET curricula have not been able to meet the demand of the industry with regard to entrepreneurship education. In other words the current TVET system is deficient in providing the necessary impetus for entrepreneurship development. The percentage of entrepreneurs in the market for the past 20 years does not match to the number of graduates in the market. Many of them have not been able to find self-employment or generate employment; they are in the market searching for jobs. This situation is not health for our economy and Africa in general. Necessary initiatives are required to rectify the situation. It is crucial to restructure TVET curricula for entrepreneurship development.

To achieve this objective, entrepreneurship training is required for TVET trainers as the case with VETA,
where trainers are equipped with entrepreneurial education first through the project administered by NUFFIC. TVET institutions are also required to build long term interaction and interrelationship with graduates and entrepreneurs so that they can benefit from each other. TVET curricula should leave much room for field work to students and there should be enough supervision for students. Government, various financial institutions and NGOs need to join hands and support young entrepreneurs for providing them with capital, training and minimizing the risks of doing business. Policy makers are also challenged to refocus their policies in problem solving rather than maintaining a status quo. In this way the benefits of entrepreneurship can be realized through increased productivity, competition, innovation, employment and prosperity for individuals and therefore revitalized economy.

REFERENCES


Western Region: The Gambia, Ghana, Nigeria and Sierra-Leone

Eastern Region: Kenya, Mauritius, Seychelles, Tanzania and Uganda

Southern Region: Botswana, Lesotho, Malawi, Namibia, Swaziland, Zambia, Zimbabwe, Republic of South Africa