ANALYSIS OF FACTORS AFFECTING TECHNOLOGICAL INNOVATIVENESS IN ENGINEERING ENTERPRISES IN TANZANIA

Emanuel A.M. Mjema
Department of Mechanical and Industrial Engineering,
College of Engineering and Technology, University of Dar es Salaam,
P.O. Box 35131, Dar es Salaam, Tanzania.
Email: emjema@uccmail.co.tz or emjema@udsm.ac.tz

ABSTRACT

This paper discusses the technological innovativeness in engineering enterprises in Tanzania and analyses the factors affecting the innovativeness. It starts by analyzing various concepts regarding innovation, then analyzed from documentary review factors affecting innovativeness and then analyzed the innovativeness in Tanzanian enterprises. From the documentary review it was learnt that the following key factors influence technological innovativeness: Existence of innovation management; Existence of market to absorb the products of innovation; Existence of partnership between the universities and the firms; Existence of positive culture and politics towards innovation; The government playing its role to influence innovation; Existence of the right knowledge; and Ability of the enterprises to access to financing institutions that support innovation.The research shows that there is hardly any fundamental innovation in Tanzania, what is presented as innovation is the copying of technologies and manufacture them using local material. The researcher established the following factors affecting the innovativeness of engineering enterprises in Tanzania: Level of education among the entrepreneurs in engineering enterprises; financing for the enterprises in Tanzania; partnership with R&D institutions; innovativeness culture; and market for Tanzanian products.

Keywords: Technology, Innovation, Innovativeness

INTRODUCTION

It is observed that the contribution of developing countries in producing new technologies and innovations is almost negligible and Africa lags far behind the others in producing new technologies and innovations (Juma, 2006). There is a need to find out why the situation is like that and what must be done in order to reverse this kind of trend. What are the prevailing situations or conditions that hinder innovation and technological development in Africa? The challenge facing Tanzania and other developing countries is to create conditions that will enable Tanzania to make full use of the globally available knowledge to improve its technological and innovativeness capacity.

It is further noted that there is none among the developed countries, whose development did not base in science and technology (Wong and Goh, 2011). With increased competition in the world for new products and better services, innovation becomes critical for sustainable development of a country. Without innovation a country will have stagnant technological development. Science, technology, and innovation are

essential to continued economic growth of a country. When analysing factors that contributed to fast development of the emerging economies (i.e. India, China and Brazil) Juma (2006) noted that at least three key factors contributed to the rapid economic transformation of emerging economies:

- They invested heavily in basic infrastructure (roads, schools, water, irrigation, telecommunications and energy);
- They nurtured the development of Small and Medium Enterprises; and
- They supported, funded and nurtured higher education institutions and mostly in Science and Technology.

The lesson that can be learnt from the emerging economies is that the source of their fast development is based on improving the status of the Small and Medium Enterprises and a lot of investments in engineering and technological sciences in higher education. At this point we have to ask ourselves, we in developing countries, especially the Tanzanian: What are we doing to improve the performance of the enterprises? What are we doing to nurture the higher education, especially in Engineering and Technological Sciences? Do we give any kind of incentives for our young generation to study science and technical subjects?

It is reported that African countries recognize the importance of science, technology and innovation in economic and social change and sustainable development and the first NEPAD Ministerial Conference on Science and Technology called on the NEPAD Secretariat to initiate activities that would generate an African Innovation Outlook (AIO), that is, a comprehensive profile or survey of the innovation landscape (UNU-INTECH, 2004). However, recognizing the importance of science, technology and innovation and putting into practice various measures that will ensure that technological innovations are taking place are two different things. We should ask ourselves "What these African governments are doing to stimulate the technological innovations in their countries?"

The Tanzanian government has developed a number of policies and measures that are aimed at improving the position of enterprises and eventually improving the technological innovations in the country. The notable policies and measure include: The National Development Vision 2025; Small and Medium Enterprise Development Policy; Sustainable Industries Development Policy (SIDP) 1996-2020; National Employment Policy, 1997; The National Strategy for Growth and Reduction of Poverty (NSGRP); Property and Business Formalisation Program (MKURABITA); The SME Competitiveness Facility (SCF); as well as Business Environment Strengthening for Tanzania (BEST). The existence of all these interventions has not changed the innovativeness and competitiveness of the Tanzanian enterprises.

One of the concerns raised about investing in technical training in African countries is the migration of skilled manpower to industrialised countries. The World Bank has estimated that although skilled workers account for just 4% of the sub-Saharan labour force, they represent some 40% of its migrants (Özden and Schiff, 2005). Our concern should not be to curb the migration of our learned people to developed countries, but how to use those Tanzanian in Diasporas for the development of the country. The most notable case is the Taiwanese Diasporas, which played a crucial role in developing the country's electronics industry (Saxenian, 2001).For example, India produces about 600,000 engineers each year. In that case, even if half of them migrate to developed countries for

greener pastures, India will still have enough engineers for the development of its economy.

The term innovation is used to describe a process in which knowledge is applied to develop new products and services or to develop new ways of designing, producing or marketing an existing product or service for public and private markets. At its simplest form of definition we can say that, innovation is embodied by a product or service offering that contains a significant element of newness. Technological innovations are measured not only by looking at the creation of new production processes but also by the adoption and adaptation of existing technologies to local conditions. This broad concept of innovation is particularly important for firms in developing countries (Almeida and Fernandes, 2007). There is a difference between innovation and invention: Invention is the embodiment of something new. While both invention and innovation have "uniqueness" implications, innovation also carries an undertone of profitability and market performance expectations.

Innovation is the quality of being novel: it refers to originality by virtue of introducing new ideas or creative ideas. Innovativeness is a noun that is originating from the main word innovative. Innovative is an adjective that refers to a situation characterized by or tending to innovation. Innovation involves acting on the creative ideas to make some specific and tangible difference in the domain in which the innovation occurs. A true innovation can take the form of a new product, new technology, new process, new content, or even the new presentation (e.g. packaging) and marketing of an existing product or service.

Various authors view the term innovation in different perspectives.Bjorn (2003) defines innovation as a continuous cumulative process involving not only radical and incremental innovation but also the diffusion, absorption and use of innovation. Lundval (1992) defines innovation as an on-going process of learning, searching and exploring, which result in new products, new technique, new form of organization and new market.

Maria (2000) defines innovation as the search, discovery, development, improvement and adoption of new products, processes and new organizational structure and procedures. Innovation is the generation and implementation of new products and processes, or market and business systems configurations offering competitive advantage for those firms that successfully develop them. The term innovation can be summarized from the following types of innovations (OECD, 1997):

- Incremental innovation*:* involves small changes in products/process or both. It is usually achieved through learning by doing and does not involve major investment or risks;
- Radical innovation*:* This makes a substantial change, but does not lead to new industry; and
- Fundamental innovation*:* This results from new scientific knowledge leading to new product and new process.

What we see in most of the innovations in the developing countries are innovations of incremental in nature. The fundamental innovations in developing countries like Tanzania are really rare. Therefore, the questions to be answered in this paper are:

a) What are the main factors that influence technological innovativeness?; and

b) What should be done to improve the innovativeness of Tanzania as a country?

Therefore the main objective of this paper is to establish factors that affect technological innovativeness in engineering enterprises in Tanzania.

Situation analysis – related works

Innovations are not seen only in industries but we have observed that farmers also innovate due to necessity, changing conditions and curiosity, doing informal experiments on new ideas either from their own ingenuity or learned from other farmers and researchers. Reij and Waters-Bayer (2002) cited two regional development projects in Africa that found that technologies generated by farmers from locally-available resources are likely to be more relevant to the majority of smallholder farmers than introduced technologies that depend heavily on external inputs.

Similarly, from industrial needs, it was observed in a country wide survey conducted in Tanzania in which a total of 2,225 entrepreneurs were interviewed, that the enterprises were not satisfied with the imported technologies and machineries due to problem of spare parts and technological support (Katalambula *et al*., 2006). The enterprises would like to have locally developed technologies but they were mostly concerned with the quality of locally develop technologies.

To improve the competitiveness of enterprises there is a need of tripartite linkage between the Government, the Universities/Research institutions, and the enterprises. The government is supposed to create an institutional setting and to sponsor a knowledge base that makes innovation possible, whereas private sector take the lead on deciding what innovative new products and services should actually be produced (Kalil, 2006). In this regard Universities/ Research institutions should develop the technologies and innovations that are needed by the SME.

Enterprises should play leading roles in the development of new opportunities and the use of technology. Policy makers need to develop, apply and emphasise the important role of engineering, technology and SME development in poverty reduction and sustainable social and economic development. The government should support business and technology incubators, export processing zones and production networks as well as sharpening the associated skills through business education (Lalkaka, 2003).

To assess technological capability, we need to identify its indicators. A strong point emphasized in the literature is that evidence of technical change is indicative of technological capability. Technical change includes modification and adaptation of any technology and the introduction of a new production process or product (Massaquoi, 1995). This means that when we are evaluating the innovativeness of enterprises we ought to look at the way they are adapting the technologies in their work environment, and the modifications that they are doing in the acquired technologies.

Being innovative involves many things: it can involve research, but it is also about focused business strategies, a global approach, competitive financing, risk management and organizational change. In practical sense, what are the factors that influence the capacity to innovate? In the following we will discuss some of the factors that influence innovativeness that have been mentioned in a number of literatures.

a) Existence of Innovation Management - A prerequisite for innovation to flourish in an enterprise is the

existence of "innovation management", which refers to planning, implementing and marketing the innovative products and services. Many enterprises encounter difficulties in planning, implementing and marketing innovative products because of poor innovation management. Kandybin and Kihn (2004) mentioned that innovation is not a discrete activity, but a multifunctional capability that requires several types of competencies. And to have an innovation capability an enterprise requires to own or to source four critical sets of capabilities: ideation, project selection, development, and commercialisation.

b) Existence of Market to Absorb the Products of Innovation - Firms that are innovative follow closely and intelligently the market needs and then develop the products or services that are according to the identified needs. Innovation is market driven and the firms are at the centre of innovation. The market to absorb the products of innovation should be there, otherwise there is no incentive to innovate, if the products cannot be absorbed by the market (Kandybin and Kihn, 2004).

c) Existence of Partnership between the University and the Firms - Universities and other research institutes play important roles in performing research and advancing the creation of knowledge. They help the private sector develop and adopt innovations. They are also the dominant players in terms of training the highly qualified people that create and apply knowledge. Higher education and research institutions in Tanzania integrate into the production sector and into society in many ways. They conduct research and development for industry; they conduct consultancies; they develop technology and business incubator facilities; and introduce entrepreneurial training. The College of Engineering and Technology of the University of Dar es Salaam has been running three technology and business incubators in Kibaha, Morogoro and Lushoto (Kimambo and Nyichomba, 2005).

d) Existence of Positive Culture and Politics towards Innovation - There is no activity in any society that happens in isolation. The culture and politics influence what researchers do and how they are conducting their researches. We need to know the linkages between culture and politics in one side and research and innovation on the other side (NEPAD, 2006).

e) The Government playing its Role to influence Innovation - The government being the main regulatory authority plays an important role as a facilitator of technological learning. By acting as active promoters of technological learning the governments can facilitate technological change in a society. Government action represents a key element in the domestic ownership and control of the development agenda (King, 2005).

f) Existence of the Right Knowledge - The creation and commercial application of knowledge is critical to the competitiveness of the private sector because the capacity to develop new and improved products for world markets depends on the level of knowledge of the human resource within the country.

g) Ability of the Enterprises to Access to Financing Institutions - Access to finance remains a major concern for businesses, including innovative enterprises. Innovative and R&D-

intensive businesses often have difficulties in obtaining finance in the stages between demonstrating a new technology, process, product or service and exploiting it commercially (CEU, 2005).

h) Existence of Innovative Clusters - It is also widely observed that the innovation performance of enterprises is reinforced when they form clusters and networks. Public policy cannot create clusters, but public funding can strengthen them (CEU, 2005). Clusters are pools of knowledge and expertise that result when specialized research facilities (federal, provincial, university and private labs) are concentrated in one particular area. These clusters then become incubation centres for innovation through partnerships and information exchange.

Clusters are defined by two key attributes: geographical/spatial distribution and sectoral dimension. Porter (1990) defines clusters as group of firms engaged in similar or related economic activities in national economy. In most cases the firms are geographically close while others are dispersed. Schmitz (1992) defines cluster as a geographical and sectoral agglomeration of enterprises. The two definitions have two same elements: a geographical or spatial dimension and a sectoral dimension.

The collective efficiency model (Nadvi, 1999) identified four variables that determine the competitiveness of clusters initiatives: market access; labour market pooling; intermediate input effects; and Technological spillovers. McCommick (2004) refers to these variables as "external economic factors" and has defined external economic factors as the unintended or incidental by-products of an economic action. Mytelka (2004) emphasised the role of clusters in promoting interactivity, which is an important stimulus for innovation to occur, however, he insisted that co-location of actors does not necessarily lead to interaction, learning and innovation.

i) Existence of Intellectual Property Rights - Much of the technological foundation needed to stimulate African development are based on public domain ideas (whose property rights have protection has expired). In this regard, intellectual property offices are viewed as important sources of information needed for laying the basis for technological innovation (Chen and Puttitanum, 2005). While intellectual property protection can serve as barrier to innovation, the challenges facing Africa lie more in the need to build the requisite human capability to use existing technologies and less in restrictive intellectual property systems. This argument may not hold in regard to emerging fields such as genomics and nanotechnology (Juma, 2006).

THE APPROACH USED

The research was conducted through documentary review, observation, and interview. Questionnaire was avoided due to the nature of the people working in these engineering enterprises, and the work environment of these engineering enterprises. The author used a structured interview in which a questionnaire like instrument was used to collect the data directly from the engineering enterprises.

Selection of the Study Area

The study was conducted in three districts of Dar es Salaam region and two urban districts in Mwanza City. The main reason for the selection of these two areas was to find areas with diversity of socio-economic activities and with high numbers of business operators, including

vocational and engineering firms. Dar es Salaam and Mwanza Cities offer high number of business enterprises, especially those in engineering field.

Sampling and Data Collection

This study used non-probabilistic judgemental sampling technique to select the study districts, the target population and the study sample. The general population comprises micro, small and medium size enterprises (MSMEs) operating as formal or informal enterprises. The target or sub-population for which the study sample was derived comprises engineering and/or vocational based MSMEs in Dar es Salaam and Mwanza regions.

To single out the study sample the researcher, purposely visited the commonly known vocational areas in the study area where engineering- and/or vocational-based operators are found. Since the sampling was not probabilistic, i.e. based on statistical procedures, a purposive sample of 66 respondents was used to generate the data. The study sample was systematically but purposively distributed in three selected districts namely namely Ilala, Temeke, and Kinondoni distribution in Dar es Salaam Region and Ilemela and Nyamagana districts in Mwanza region.

Specifically, the researcher systematically focused on workshops located in or along designated vocational and/or engineering – based areas such as SIDO workshop along Nyerere road (Ilala district), Gerezani (Ilala district), Chang'ombe (Temeke district) and Mwenge carvings (Kinondoni district). For the case of Ilemela and Nyamagana districts, Igoma, Nyakato, Mkuyuni, Mwanza South Industrial areas were chosen. Table 1 shows a complete list of the studied enterprise in the 4 selected study areas.

Table 1: Type of small engineering-based enterprises in the study areas

Type or Nature of activity	No of firms visited	Proportion to sample (%)
Furniture making	10	15.2
Wood working machines fabrication	5	7.6
Sheet metal fabrication	11	16.7
Machine Construction	3	4.5
Chick incubator fabrication	1	1.5
Electrical inverter construction	4	6.1
Food Processing machines fabrication	4	6.1
Foundry activities	7	10.6
Hand water pump fabrication	1	1.5
Motorcycle repair	6	9.1
Motor rewinding	10	15.2
Compacted Soil bricks machine fabrication	4	6.1
Total	66	

RESULTS AND DISCUSSION

Age of the enterprise

The age of the enterprise visited varied from 1 year of existence to more than 15 years in business. Table 2 summarizes the age profile of the enterprises visited.

Ownership of the enterprises

The ownership of the engineering enterprise visited is as depicted in table 3. Most of these enterprises (64%) are owned by individuals, the second category in popularity of ownership is a partnership (23%) and other types of ownership are not much popular here in Tanzania.

Table 2: Age Profile of the enterprises visited

S/No	Year of Start of Business	Number of Enterprise	(%)
1	Before 1994	4	6
2	1994 - 1996	8	12
3	1997 - 1999	10	15
4	2000 - 2002	7	11
5	2003 - 2005	18	27
6	2006 - 2008	17	26
7	Not answered	2	3
	Total Value	**66**	**100**

Table 3: Ownership of the enterprises

S/No	Year of Start of Business	Number of Enterprise	(%)
1	Private	42	64
2	Partnership	15	23
3	Cooperative	2	3
4	Group	3	4
5	Not answered	4	6
	Total Value	**66**	**100**

Qualifications of owner

In most of the enterprises the owner is managing the whole activities of the enterprises. Even most of the ideas for the products are coming from the owner. Knowing this kind of situation, the researcher was interested to know the qualifications of the owner of these enterprises. Table 4 summarises the profile of the qualifications of the owner. From the data shown on Table 4 only 12% of the engineering enterprises are owned and de facto lead by graduate engineers (both diploma and degree holders). One would have expected that more graduate engineers from Universities and Technical Institutes would own most of the engineering enterprises than graduate from vocational schools. It seems that graduates from Universities and Technical Institutes are not entrepreneurs or they do not invest in types of SMEs visited.

Table 4: Qualification of the owner

S/No	Level of Education	Number of Enterprise	(%)
1	Primary education	12	18
2	O-level (Form IV)	8	12
3	A-level (Form VI)	2	3
4	Vocation Education (TT I III)	22	33
5	Full Technician Certificate	5	8
6	Diploma Holder Engineers	6	9
7	University Degree	2	3
8	Not answered	9	14
	Total Value	**66**	**100**

It is known that the qualification of the owner plays a decisive role on the activities that are being done by the enterprises and from the literature review conducted, it was shown that existence of right knowledge is critical to competitiveness of the private sector. It was also observed that the performance of these engineering enterprises is mostly a one-man show. Therefore, if the qualification of the owner is low, we do not expect radical innovation, we will expect mostly modifications of the existing technologies. Therefore there is a need for more entrepreneurship education for University Engineering students in order to ensure that the entrepreneurs in engineering enterprises have the right knowledge.

At the University of Dar es Salaam all the engineering students are studying entrepreneurship courses. Also the

government is paying full loans for students taking engineering subjects as a kind of incentives for our young generation to study science and technical subjects.

Qualifications of the employees of the enterprises

The enterprises were required to show the qualification profile of their workforce. A table was prepared where the engineering qualifications depicted on Table 5 were listed. The enterprises were required to put the quantity of employees in each category. The data depicted in Table 5 show the number of enterprises, which showed that they have people having the qualifications. Out of the 66 enterprises visited only 2 had graduate engineers of the level of B.Sc (Eng.) and only 6 enterprises had Diploma holder graduate engineers. The rest of the enterprises were run mostly by VETA graduates with TT as their highest qualifications, and the STD VII leavers as the main workforce.

With this kind of qualifications in the enterprises it is hardly possible to get true innovation of products or process. From the literature review it was shown that the existence of high quality innovation depends on the level of knowledge of the human resource. We don't expect to get state of the art innovations from these enterprises unless something is done to nurture the enterprises, or to transfer the knowledge from R&D institutions to these enterprises.

Source of funding

Responding to the question regarding the source of funding, the data shows that 75% of the businesses were started using own funds, 9% got loan from friends and family members, 6% got the donor financing group works, and 10% did not mention the source of their financing. In Tanzania there is no financial institution that is supporting the small enterprises in carrying out innovative researches. Even the existing "SME Competitiveness Facility (SCF)" is not geared towards supporting the innovativeness in the SMEs. We suggest that the government should create competition in innovation, which are financially supported in order to unearth the innovativeness in SMEs.

Table 5: Qualification of the employees of the enterprises

S/No	Qualification	Number of Enterprise	(%)
1	B.Sc (Eng.) or above	2	1.0
2	Advanced Diploma in Engineering	1	0.5
3	Ordinary Diploma Engineering	5	2.5
4	FTC	8	4.0
5	Trade Test I (TT I)	14	7.0
6	Trade Test II (TT II)	38	19.1
7	Trade Test III (TT III)	42	21.1
8	Form VI	3	1.5
9	Form IV	12	6.0
10	STD VIII	8	4.0
11	STD VII	60	30.2
12	Others	6	3.0
	Total Value	**199**	**100**

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which are financially supported in order to unearth the innovativeness in SMEs.

Entrepreneurial Disposition

When asked about the source of the ideas to start the enterprise, the responses are as follows: they were unemployed and did not have other alternative but to employ themselves (25%); my own interest in this business (18%); was underpaid and decided to start own business (16%); the enterprise was family business and they inherited it from the family (14%); someone suggested it to be that it is a good business (8%); wanted to use his/her professional knowledge fully (5%), saw others doing the business and decided to copy (5%); saw that there were a demand for that product (4%), attended a seminar (3%) and no response (2%).

What we can see from these kinds of responses is that most of these engineering enterprises were started out of necessity. Entrepreneurship disposition can be seen within those who had the interest to do that kind of business (18%); those who wanted to use their professional knowledge fully (5%) and those who saw that there was a demand for the product (4%). So we can conclude that only about a quarter of the interviewed enterprises were true entrepreneurs, the remaining were just business people.

Entrepreneurship disposition help to boost the innovativeness by trying to fulfil the local demand of products and services. In so doing they use their ingenuity to discover new products and services in an innovative way.

Observed Innovation and Invention

The observed innovation process is mostly the reverse engineering. Very few had inventions of their own without doing modifications or copying the existing machine or product components. For example, one entrepreneur who manufactures propellers for boats in Mwanza City mentioned that at first he bought a new propeller, dismantled it and created a mould based on the dimensions of the dismantled propeller and started to manufacture the propeller by casting. Later on, he studied the properties of material and alloys and learnt how to mix several metals to get the alloy they want for making propellers of different strengths. The following are some of the observed innovations and inventions that are being done by our engineering enterprises:

- A spinning lathe – the entrepreneur used an old and abandoned lathe machine frame and an old 304 Peugeot gearbox and a motor to innovate a spinning lathe machine;
- Several innovator in Dar es salaam and Mwanza are manufacturing welding machines from scraps;
- Several innovator in Dar es salaam and Mwanza are manufacturing battery chargers from metal scraps and winding wires;
- One entrepreneur in Mwanza has developed a mixer for mixing paints and polish;
- Several innovator in Dar es salaam and Mwanza are manufacturing satellite dishes from metal sheets;
- One innovator in Mwanza manufactured a wood planner - initially he copied the technology to produce a wood planning machine but later on carried more modifications to produce a better wood planner;
- One innovator in Mwanza is manufacturing water pumping machine from the scratch; and
- Several innovators in Dar es Salaam and Mwanza are manufacturing bricks making machines.

From the interview conducted, it was observed that it is only about 7% of them have creative tendencies such as imaginative and innovative mind, day-dreaming about a certain product if they

have enough resources, love of novelty and change. The remaining (93%) did not have creative tendencies; they simply copied existing products and manufactured the products in their workshops without doing any further modifications. But since we know that the level of education of these engineering entrepreneur is very low, then we can conclude that the level of education has something to do with the level of innovativeness.

Linkage with R&D institutions

Table 6 shows the number of enterprises owners who know the existing research and development institutions in Tanzania.

Table 6: Engineering R&D institutions known by the enterprise owners

S/No	R&D Institution	Number of Enterprise	(%)
1	Engineering UDSM	22	22.4
2	Dar es Salaam Institute of Technology (DIT)	14	14.3
3	VETA	44	44.9
4	SIDO	8	8.2
5	CAMARTEC	6	6.1
6	No Response	4	4.1
	Total	**98**	**100**

Since the majority of the owners of these engineering enterprises are VETA graduates; then no wonder that they consider VETA as an R&D institution. In fact VETA do not carry out researches but they develop some technologies that have been researched by higher institutions such as the UDSM, TIRDO and CAMARTEC. The next question was whether they have ever approached these institutions for technological advice. The responses show that 6% have approached Engineering UDSM, 10% approached DIT; 22% approached VETA; and the rest (62%) have never approached any institution for technical advice.

Since the majority of the SMEs do not approach the R&D institutions, and the R&D institutions do not have outreach programs to reach these SMEs for transferring their technologies, then there is a linkage problem, which will hinder technological innovations in Tanzania. The Tanzanian government, the SMEs and the R&D institutions should make a concerted effort to ensure that a linkage is fostered to improve the innovation in Tanzania.

Market for the SMEs Products

When asked whether or not there is a high demand of their products, the majority of the respondents (67%) said no. When asked if no what are the reason that there is no high demand for their products 22% mentioned that there is a stiff competition in the market; 18% mentioned that the majority of Tanzania prefer imported goods to the local made products; only 6% mentioned that locally made products are of low quality while the remaining (54%) did not answer this question.

Lack of market to absorb the innovation products from the SMEs is a factor that hinders further development of the products. If the enterprise owners could see that there is ample market for their products, then they could invest more in developing their products.

Recommendations for improvement of innovativeness of Tanzanian SMEs

From the results of this work, the following recommendations were drawn:

- The Engineering and Technology R&D institutions in the country need to carry out outreach programmes and use the SMEs as areas for transferring their technological innovations that are being inverted at these R&D institutions.
- The government through the SME Competitiveness Facility (SCF) and

Business Environment Strengthening for Tanzania (BEST) should invest in supporting researches that are aiming at innovation and competitiveness.

- There is a need of developing science and technological parks to support enterprises that are innovative.
- High learning institution should have strong discussions with the government on STI budgeting. Through the STI budgeting, the government signed international agreement that it will spend 1% of its annual budget on Science, Technology and Innovation (STI). This budget should be used for scientific and technological development in higher learning institutions, especially the Engineering and Technological sciences.
- The government should offer full bursary for young generation that is striving to study science and technical subjects. Special programmes for science and technology should be introduced in Secondary Schools (e.g. competition in science and technology and giving financial awards to students and schools that are performing well in science competitions)
- The government could start annual awards for innovations and have annual forums where scientific and innovation exhibitions could be displayed.

CONCLUSIONS

One of the main factors that affect innovativeness is the level of formal education. It was found that out of the 66 enterprises visited only 2 had graduate engineers at the level of B.Sc (Eng.) and only 6 enterprises had Diploma holder graduate engineers. The rest of those engineering enterprises were being run by VETA graduates with Trade Test (TT) as their highest qualifications, and some of them were STD VII leavers.

Another important factor for innovation is the funding for innovation. It was found that 75% of the businesses were started using own funds. This shows that the majority of these entrepreneurs do not have access to the financing institutions.

Entrepreneurship disposition is another factor affecting innovativeness. It was found that the majority of the engineering entrepreneurs surveyed started their business out of need without any entrepreneurship disposition. Only about 27% of the respondents had entrepreneurship disposition (i.e. only those who had the interest to do that kind of business – 18%); those who wanted to use their professional knowledge fully (5%) and those who saw that there was a demand for the product (4%)).

It was observed that only 7% of them have creative tendency such as imaginative and innovative mind, day-dreaming about a certain product if they had enough resources, love of novelty and change. The remaining (93%) did not have creative tendency; they simply copied the existing product and manufactured them without doing any modifications.

Linkage with R&D institutions could help the entrepreneurs to have access to the latest technologies but the survey revealed that 62% of the surveyed enterprises had never approached any R&D institution for technical advice.

Another important factor for nurturing innovation is the existence of the market for the innovation products. The survey shows that there is a low demand for the product that are coming from these MSMEs. Lack of market to absorb the innovation products from the MSMEs is a factor that hinders further development of the products.

One of the important recommendations for improving innovativeness of the Engineering SMES is for the Engineering and Technology R&D institutions in the country to carry out outreach programmes and use the SMEs as areas for transferring their technological innovations that are being inverted at these R&D institutions. Another recommendation is to have technological parks in which Engineering SMEs can be nurtured to maturity level before leaving the parks.

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