

*Full Length Research Paper*

# An analysis of the technical and vocational skills gaps in the manufacturing industry in Malawi

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Received 9 August, 2016: Accepted 1 March, 2017

This study presents the findings of skills scoping study for the manufacturing industry in Malawi. The study analyse the skills gaps in the sector to inform the development and review processes of technical and vocational education programmes in the country to help balance the demand and supply of skills equilibrium. Currently, research indicates a mismatch between the range of programmes in training institutions and needs of the industry due to weak linkages. The study used interviews, questionnaire and document analysis to investigate the skills situation. While most of the required skills are readily available on the local market, the results reveal a scarcity of expertise in certain critical areas within the beverages, agro-processing, plastics and packaging as well as assembly sectors. There are also quality and quantity shortfalls affecting the supply of technical and vocational skills. The depth of course content is low in fields such as automobile engineering (designing and assembling). The results further indicated that the industry is lacking multi-skilled technicians capable of performing multiple functions within their areas of expertise. Furthermore, a majority of the technical personnel in all the four sectors of the manufacturing industry possess limited supervisory and communication skills.

**Key words:** Technical, entrepreneurial and vocational education and training (TEVET), skills gaps, manufacturing industry, Malawi.

## INTRODUCTION

Over the last two decades, technical, entrepreneurial and vocational education and training (TEVET) seems to have taken a pivotal position in the educational plans of most African countries. Afeti (2012) observes that one important feature of TEVET is its orientation towards the world of work, and the emphasis of the curriculum on the acquisition of employable skills. TEVET responds not only to the needs of different types of industries, but also prepares learners for gainful employment and sustainable livelihoods.

This study presents part of the findings of a wide skills scoping study conducted in 2014 on the supply and

demand of skills critical for the growth of the manufacturing industry in Malawi. The study was conducted to identify the skills gaps that are hindering the development of the industry. Whilst the National Export Strategy (NES) observes that the availability of appropriate technical and vocational skills could play a vital role in increasing the productivity and competitiveness of these industries, there is currently limited access to technical and entrepreneurial skills which constitute a binding constraint on the ability of the country to increase the productivity of small and medium enterprises (Government of Malawi, 2013).

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The latest available statistics indicate that out of 11,829 people who applied for places in the apprenticeship programmes in 2013, only 1,084 trainees were selected to attend training in various public and private technical colleges in the country. This represents a selection rate of 9 percent, which is critically low (TEVETA Malawi, 2013). According to TEVETA Malawi website, the authority intends to select 1,480 trainees for the 2017 academic year which commences in January 2017. Thus, the selection increase for the TEVET sector will only rise by 37% between 2013 and 2017.

Despite the fact TEVET continue to fuel development in many countries, Maclean and Lai (2009) observe that TEVET curricula have lost their relevance to the requirements of the labour market. TEVET institutions need to improve their capacity to make use of labour market information, including market signals, indicators and intelligence, for planning and curriculum modernisation. This study involved a situational analysis of the technical and vocational skills available in the industry, highlighting the current skills gaps and recommending strategies, which could help address, the shortfalls.

Another study, which mapped and analysed the TEVET sector in Malawi, indicates that the ultimate goal of skills development in the country is to facilitate the reverse of the current negative trade balance between imports and exports (CfBT, 2013).

## LITERATURE REVIEW

The concepts of skills shortage and skills gap have been used differently by different authors. While some authors have used the two concepts synonymously, others have laboured to point out inherent differences between them (Campbell et al., 2001).

To begin with, the UKCES (2010) observe that applied economists tend to use a pragmatic approach to understanding the concept of 'skill' as the ability to perform specified tasks. This concerns classifying skills in two dimensions:

1. According to what the particular tasks are and
2. According to what level of ability is needed. By implication, a job can be described in these terms and so too can a person.

To delineate the concepts of skills shortage and skills gap, Trocko (2015) defines the skills gap as the void between the skills that job applicants possess and those that employers require, while Skills (2001) describes skills shortages as a deficiency of suitably skilled people available in the labour market. Skills gaps arise where a firm has employees but they are not skilled enough to meet the organisations' objectives (Campbell et al., 2001).

Thus, the gaps are the deficiencies between the skills of the current workforce and those required to meet business objectives. Skills gaps are measured by asking employers about the expertise of their current staff. On the other hand, skills shortages occur when firms cannot fill vacancies. They concern the scarcity of relevant suitably skilled people available in the labour market, relative to the jobs that employers are offering.

Skills shortages and gaps in both developed and developing countries constrain companies' ability to grow, innovate and deliver products and services on time (Aring, 2012). As such, the companies fail to meet quality standards as well as environmental and social requirements in the countries where they operate. However, the World Economic Forum (2010) points out that closing the skills gaps would improve productivity, employment, and enterprise creation in both the formal or informal sector (Aring, 2012).

The problem of skills shortages and skills gaps is part of the broad issue concerning human capital. The WEF (2010) argues that the world is facing a 'global demographic shock' where human capital will soon rival or surpass financial capital as the critical economic engine of the future. Along this line, Aring (2012) suggests that the current skills shortages are caused by a qualitative skills mismatch where companies do not find graduates employable even when they have the right qualifications on paper and a quantitative mismatch where inadequate young people are educated and trained at certain levels. In other cases, young people migrate to countries where they can earn higher wages.

Baah-Boateng (2013) sheds light on how the African continent is endowed with an abundance of natural resources such as minerals, oil reserves, fresh water bodies and fertile soils. However, economic transformation continues to elude the continent largely due to human capital constraints in the form of knowledge and skills to exploit the natural resources to promote growth and economic prosperity.

According to the human capital theory, employees contribute to production output just like other factors and drives both innovation and imitation through technological change (Becker, 1975). The theory focuses on the competencies, knowledge, and personality attributes incorporated in labourers' ability to produce economic gains for the individual and businesses. Human capital theorists suggest that organisations develop resources internally only when investments in employee skills are justifiable in terms of future productivity (Tsang et al., 1991).

Human capital has an emphasis on the cost of labour relative to the return on investment in order to gain future productivity by developing employees' skills and knowledge. While employees own their human capital, businesses work hard to protect these skills and knowledge so that they are not transferred to other businesses.

**Table 1.** Statistical representation of the participating organisation.

Industrial sector	No. of organisations	No. of questionnaire respondents	No. of interviewees
Beverages	3	6	6
Agro-processing	11	22	18
Plastics and packaging	6	12	12
Assembling	8	16	16

Adams (2002) contends that human capital affects the structure of national production and technological levels. He further notes that economies endowed with more educated people are able to improve local technologies since the use of new technologies requires a high quality workforce. For Africa, the low quality of human capital base continues to be a major constraining factor in the economic development effort of many African countries (Baah-Boateng, 2013).

The ability of sub-Sahara Africa countries to take advantage of new technological innovations in the fast changing globalised world to transform the economies is often constrained by poor quality of the labour force. Trocko (2015) hints that the existence of skills gaps in various economies could be blamed on the academia for deficiencies in preparing students for the workplace, as well as a lack of job-specific training.

## METHODOLOGY

This study used the mixed methods approach. Taylor and Medina (2013) observe that drawing on multiple methods and analysing issues from varied perspectives provide educational researchers an opportunity to make a major contribution to aligning curricula and classroom teaching and learning practices with the complex and challenging needs of the 21st century.

It also provides a more comprehensive outlook (Pozzebon et al., 2014), allows alternative approaches to building the body of knowledge (Chen and Hirschheim, 2004), and provides freedom of well-informed choice and the potential for transformative research design (Taylor, 2008). Three main techniques were employed to collect data in this study: questionnaire survey, interviews and document analysis. The data collection exercise took two months and was conducted in 2014.

A total of 28 organisations from the manufacturing industry participated in this study. Of the 28 organisations, 3 came from the beverages sector, 11 from the agro-processing sector, 6 from the plastics and packaging sector and 8 from the assembling sector. Statistical representation of the participating organisation is provided in Table 1.

According to the Malawi Ministry of Industry and Trade, there are 40 registered organisations in; this industry and the sample represented 63% of the registered organisations in the country. The study targeted personnel in the production and human resource departments who provided data on the human capital requirements in each organisation against the production processes. The original plan was to include all the 40 organisations but some did not confirm their participation in good time while others were non-committal. Other government ministries and agencies such as the Ministry of Education, Ministry of Labour and the TEVETA Malawi were also included in the study to provide insight into the relevant skills policy and planning issues.

The data collection exercise commenced with a review of relevant documentation which included policy documents and strategies such as the Malawi Growth and Development Strategy II, the National Education Sector Programme (2012 to 2017), education sector implementation plan (ESIP) 2009, TEVET Policy (2013) and National Export Strategy (2013 to 2018). The study also reviewed the TEVET Policy and Act (2013), Mapping and Analysis of the TEVET Sector (2013), National Labour Market Survey (2009) and National Labour Market Survey (2013). The process involved visits to various government ministries and departments as well as other organisations with a stake in the TEVET sector where diverse policy documents, strategies and reports were collected. Internet searches were also conducted to obtain both local and international publications on developments that have taken place in the TEVET sector. The document analysis was conducted to determine the current state of the skills situation in the manufacturing industry. While most of the data generated through this technique was based on empirical evidence from research studies, other elements of the data were basically plans and strategies for the future.

Fifty two face-to-face interviews were also held with personnel in the selected organisations. The interviews, which were semi-structured, involved 19 staff members from the production departments and 33 from the human resource departments in the participating organisations. The interview guide included questions on the level of linkage between each organisation and training institutions, and the courses which they would recommend training institutions to introduce to address shortage of expertise on the local labour market. The interviews were conducted in a semi-structured manner to allow follow-up questions and exploration of emerging issues. Each interview was recorded and later transcribed prior to data analysis. The primary advantage of semi-structured interviews is that they assist in collecting much detailed information than other methods such as structured interviews and questionnaires (Woods, 2011).

They also help in the standardization of questions which increases data reliability, aid replication and facilitates the ability to ask spontaneous questions on issues which are sensitive to the participants. A questionnaire survey was also administered to complement the interviews and targeted the same departments. A total of 56 questionnaires were collected representing a response rate of 100 percent. The questionnaire included an item on the stages or processes followed in the production line of each organisation as well as the expertise required in each of these stages or processes. Another question focused on the skills which the organisations find difficult to obtain from the local market and the levels of these skills (operative, artisans, technicians or specialist). There was also a question on current staffing levels in each organisation against skills shortages and skills gaps. Data collected from the questionnaires was analysed using basic descriptive statistics and has been presented in tables in the next section.

## FINDINGS AND DISCUSSION

The findings present the complete set of technical and

**Table 2.** Summary of the skills situation in the beverages sector.

<b>Beverages industry</b>	
<b>Skills demanded</b>	<b>Skills supplied</b>
Machine operators; Boiler operators; General fitters; Electricians; Welders; Motor vehicle mechanics; Dairy technicians with knowledge in microbiology; Field agricultural extension workers; Mechanical engineering technicians; Mechatronics technicians; Hybrid (multi-skilled) electricians with both electrical as well as electronics engineering knowledge; Electrical engineering technicians; Instrumentation technicians; Refrigeration technicians; Electrical engineers; Mechanical engineers; Master brewers	Machine operators; Boiler operators; General fitters; Electricians; Welders; Motor vehicle mechanics; Dairy technicians; Field agricultural extension workers; Mechanical engineering technicians; Electrical engineering technicians; Refrigeration technicians; Electrical engineers; Mechanical engineers
<b>Skills not supplied</b>	<b>Skills supplied but not adequate in quality and quantity</b>
Instrumentation technicians; Master brewers	Boiler technicians; Dairy technicians; Dairy technologists; Refrigeration technicians; Mechatronics technicians; Hybrid (multi-skilled) electricians with both electrical as well as electronics engineering knowledge; Dairy technicians with knowledge in microbiology; Mechanical engineers with trouble shooting skills for computerised systems; Electrical engineers; Seed breeding experts

supervisory skills that are required in each field, and then isolate skills which are available locally against those which are difficult to find or completely not available. Skills limited in quality and quantity are also identified separately. In this study, quality is measured in terms of relevance of the skills or curricula in meeting industrial needs as well as their currency. Within each field, the skills are analysed according to the levels outlined in the Malawi TEVET Qualifications Framework (TQF) which comprises assistant operatives (Level 1), operatives (Level 2), artisans (Level 3) and technicians (Level 4).

For small companies and few large ones which are keen on maintaining lean staffing levels, it was revealed that operatives and artisans perform multiple functions for Levels 1 up to 3. Beyond the TQF, the study also analyses skills at the professional or specialist level comprising graduate (bachelor's degree) and postgraduate (postgraduate diploma and above) certificate holders. The companies comprised in this industry are sub-categorised in four: beverages, agro-processing, plastics and packaging and assembly sectors.

The findings obtained through the questionnaire survey have primarily been presented in form of tables depicting the skills on demand, skills available locally and deficiencies in skills in terms of both quality and quantity. They also show basic statistics on the extent of skills shortages for each sector. Responses from the interviews have been used to corroborate questionnaire survey results.

### **Beverages sector**

The participating organisations in this sector comprised

three organisations – a brewing company, dairy products firm and juice producer. The results of the interviews showed that the production processes in the beverages sector include milling, starch conversion, homogenisation, pasteurisation, separation, juice mixing, fermentation, maturation, distillation, filtration, molecular sieve dehydration, packaging and distribution.

At the operative and artisan levels, the sector mainly requires the services of machine operators, boiler operators, general fitters, electricians, welders and motor vehicle mechanics. At the technician level, they need dairy technicians, field agricultural extension workers, mechanical engineering technicians with expertise in boiler maintenance, electrical engineering technicians, instrumentation technicians and refrigeration technicians. They also recruit electrical engineers and mechanical engineers to maintain boilers at the graduate and postgraduate levels. The questionnaire survey indicated skills gaps in this sector as presented in Table 2.

Table 2 shows a mismatch between the demand and supply of skills in this sector. While some skills are lacking in terms of quality and quantity, others are completely not available on the local labour market. This state of affairs corresponds with Aring (2012) observation that there's currently a qualitative skills mismatch where companies struggle to get the right employees with appropriate skills and a quantitative mismatch where labour markets fall short adequate numbers of qualified people.

The interview findings also indicated that all the six respondents in this sector (representing 100%) experience a shortage of boiler technicians, dairy technicians, refrigeration technicians and electrical and electronics technicians. These skills occur at the

**Table 3.** Skills shortages in the beverages sector.

Skills area	TQF level	Shortage of experts
General fitters	2 and 3	6
Electricians	2 and 3	6
Welders	3 and 4	6
Motor vehicle mechanics	4	6
Dairy technicians	4	3
Dairy technologists	4	6
Mechanical engineering technicians	4	6
Electrical engineering technicians	4	6
Instrumentation technicians	4	6
Refrigeration technicians	4	6
Electrical engineers	Undergraduate	3
Mechanical engineers	Undergraduate	3
Master brewers	Postgraduate	3

technician level in the TQF and are the missing link in the industry. Two respondents from the brewing company (representing 33%) also complained that they struggle to get hybrid (multi-skilled) technicians on the local market skilled in both electrical as well as electronics works. They further indicated a shortage of master brewers.

Furthermore, two respondents from the dairy firm (33%) complained about a lack hybrid dairy technicians with knowledge in microbiology. Furthermore, all the six respondents (100%) pointed out that there is currently weak linkage between the industry and training institutions which has led to the existing crop of engineers having limited practical knowledge of the machinery used in the sector and lacking trouble shooting skills for computerised systems.

As the Human Capital theory suggests, quality employees add value to production processes and influence the level of innovation and imitation (Becker, 1975). The African Union notes that one reason why graduates remain unemployed in Africa due to the mismatch between training and labour market skill demands (AU, 2007). A lack of input from prospective employers into curriculum design and training delivery as well as the absence of entrepreneurial training in the school curriculum are partly responsible for the mismatch and incidence of high unemployment.

One interviewee from the juice producer, representing 17%, further observed that there is a general lack of seed breeding expertise in the country to facilitate the development of seed banks for various crops. The respondent hinted that seed banks could provide a reliable support base for the agro-based industry to ensure sustainable availability of various seeds. The questionnaire survey further exposed the extent of skills shortage in this sector as shown in Table 3.

Table 3 shows inadequacy of experts at almost all levels of the TQF. During the interviews, one respondent

from the brewing company (17%) indicated that the distribution or transportation of its products is affected by limited capacity of hybrid mechanics to fix automotive faults in new technology vehicles. The respondent recommended the introduction of engineering courses such as mechatronics – a blended course in motor vehicle mechanics and modern auto-electronics – as a long-term solution.

### Agro-processing sector

This sector included cooking oil producing companies, flour producers, biscuits company, meat products company, a fishing company and sugar producer. While the general production processes in the agro-processing industry include grading of raw materials, milling, seed crushing and oil extraction, cooking and heating, labelling and packing, the interview results revealed that the fishing sub-sector performs other special processes such as drying, smoking, refrigeration and packaging.

The results also showed that this sector requires the operative and artisan expertise of millers, pan boiler operators, general fitters, electricians and machine operators, welders and fabricators, turners, and expeller operators. The fishing sub-sector also needs fishing deck crew as well meal assistants and meal attendants who work in the production of livestock feed. At the technician level, the experts required in the agro-processing sector are quality controllers, pan boiler technicians, food technologists, fishing skippers, mechanical engineering technicians, electrical engineering technicians and instrumentation technicians. While all the 18 interview respondents (representing 100%) indicated that they need specialists such as mechanical engineers and electrical engineers, the two respondents from the fishing sub-sector (11%) further requires marine engineers. A

**Table 4.** Summary of the skills situation in the agro-processing sector.

<b>Agro-processing sector</b>	
<b>Skills demanded</b>	<b>Skills supplied</b>
Millers; Pan boiler operators; General fitters; Electricians; Modern technology machine operators; Welders and fabricators; Turners; Expeller operators; Fishing deck crew; Livestock meal assistants; Livestock meal attendants; Quality control supervisors; Pan boiler technicians; Food technologists; Fishing skippers; Mechanical engineering technicians; Electrical engineering technicians ; Instrumentation technicians; Advanced refrigeration technicians; Hybrid technicians(with multiple specialisation) in various fields; Marine engineers; Mechanical engineers ; Electrical engineers	Millers; Pan boiler operators; General fitters; Electricians; Machine operators; Welders and fabricators; Turners; Expeller operators; Fishing deck crew; Livestock meal assistants; Livestock meal attendants; Quality control supervisors; Pan boiler technicians; Food technologists; Fishing skippers; Mechanical engineering technicians; Electrical engineering technicians ; Marine engineers; Mechanical engineers; Electrical engineers
<b>Skills not supplied</b>	<b>Skills supplied but not adequate in quality and quantity</b>
Instrumentation technicians; Advanced refrigeration technicians; Modern technology machine operators; Quality standards certifiers; Hydro-electric engineering; Finance-for-non-finance experts (for specialists); Project management skills; Factory sewing machine technicians	Turners; Turner technicians; Expeller operators; Modern technology machine operators; Pan boiler technicians; Expeller technicians; Electrical engineering technicians; Laboratory technicians; Fishing skippers; Advanced auto-mechanics; Advanced refrigeration technicians; Marine engineers; Hybrid technicians(with multiple specialisation) in various fields; Food safety and hygiene technologists; Farm supervisors; Preventive maintenance skills; Work ethics skills; Occupational health and safety skills; Leadership and managerial skills

summary of the skills situation in this industry as obtained through the questionnaire survey is presented in Table 4.

The questionnaire survey results showed that all the 22 respondents in this sector (100%) face a shortage of turners, expeller operators, modern technology machine operators, instrumentation technicians, pan boiler technicians, condition-monitoring technicians, expeller technicians, advanced auto-mechanics, electrical engineering technicians and laboratory technicians. Additionally, the two respondents from the fishing sub-sector (9%) stated that they struggle to find fishing skippers, advanced refrigeration technicians and marine engineers. As Baah-Boateng (2013) observes, low quality of human capital base continues to be a major constraining factor in the economic development effort of many African countries. For sub-Saharan Africa, this challenge hinders countries from utilising new technological innovations to develop their economies as is the case in the developed world.

During the interviews, eight respondents in this sector (representing 44%) indicated that the sector's experts require training on health and safety issues as well as quality standards certification. Furthermore, 16 of the respondents (representing 89%) also pointed out the need for training institutions to engage the industry on staff exchange programmes which would allow academics an opportunity to gain valuable practical industrial experience.

These results concur with Trocko (2015) who argues that the failure to adequately prepare students for the workplace as well as existence of skills gaps in various

economies should be blamed on the academia. The participants further noted that the teaching in most universities and colleges currently focus more on theoretical applications rather practical transfer of skills. The World Economic Forum states that closing the skills shortages and gaps would improve productivity, employment and enterprise creation in both the formal and informal sectors (WEF, 2010). Table 5 provides a clear picture of the skills shortages in the sector according to the questionnaire survey. In relation to Table 5, the questionnaire survey results indicated an acute shortage of turners, instrumentation technicians, pan boiler technicians, expeller technicians, automotive mechanics and refrigeration technicians.

Furthermore, 12 of the interviewees in this sector (67 %) advocated the integration into the curriculum of courses in the fields of turner technician, factory sewing machine technician, hydro-electric engineering, food safety and hygiene technology and preventive maintenance. They further recommended the introduction of blended electrical and electronics engineering which includes instrumentation and a course on work ethics to address theft and corruption incidence in existing programmes.

Other courses proposed include finance-for-non-finance experts, project management, occupational health and safety and leadership and managerial skills. Eight respondents from the participating organisations, translating to 44%, also complained during the interviews about the low level of quality among current technicians, particularly farm supervisors, which forces management

**Table 5.** Skills shortages in the agro-processing sector.

Skills area	TQF level	Shortage of experts
Turners	3	18
Instrumentation technicians	4	18
Pan boiler technicians	4	18
Expeller technicians	4	12
Laboratory technicians	4	9
Fishing skippers	3	9
Automotive mechanics	4	18
Refrigeration technicians	4	18
Marine engineers	Undergraduate	3
Mechanical engineers	Undergraduate	3
Master brewers	Postgraduate	3

to take a hands-on approach in running the entities. Although the world is faced with a chronic misalignment of the education system to the needs of the labour market, City and Guilds (2010). International argues that the problem is huge for developing countries where only 10 to 20% of young graduates are considered employable by international standards (Aring, 2012).

### Plastics and packaging sector

This sector comprised plastic products manufacturers and producers of packaging materials. The interview results showed that the processes of production in this sector include designing, moulding, extrusion, melting, weaving, cutting, flattening, stitching, plastic printing and baling as the major processes of production.

At the operative and artisan levels, all the 12 respondents in this sector (representing 100%) registered a requirement of the services of extruder machine operators, plastics printers, general fitters, boiler machine operators and welders. While all the respondents (100%) mentioned the need of plastic products designers, plastics packaging technicians, laboratory technicians, mechanical engineering technicians and electrical engineering technicians at the technician level, only two respondents (17%) identified refrigeration experts as the required expertise at this level. At the specialist level, all the respondents (100%) indicated the need for mechanical engineers and electrical engineers while four respondents (33%) named procurement specialists as critical experts needed in this sector. The findings from the questionnaire survey in relation to the skills situation in this sector are presented in Table 6.

All the 12 questionnaire respondents in this sector (100%) noted that skills shortages in this sector exist at the operative and artisan levels for steam boiler operators, operators for the injection, blow moulding and extruder machines and qualified general fitters equipped with knowledge of new production technology. At the

technician level, 10 respondents (83%) stated that there is a shortfall of plastic products designers, plastics packaging technicians, electrical engineering technicians and mechanical engineering technicians who can maintain modern technology machines while six respondents (50%) bemoaned a lack of laboratory technicians with knowledge in plastics technology.

These results agree with Aring (2012) contention that the mismatch between training and employment is exacerbated as new technologies continue to shift skill requirements for how work gets done. The interview results showed that most of the companies in this sector have acquired new machinery for plastics production but cannot get graduates with the appropriate expertise to operate them. The shortage of experts in this sector, as depicted by the questionnaire results, is presented in Table 7.

Except for the special skills in plastics technology, the experts lacking in this sector are similar with those of the other sectors. Trocko (2015) points out that another challenge contributing to skills shortages and gaps is the speed at which workplace needs are changing in today's world. While many of today's jobs did not exist two decades ago, the job landscape will again be different in the next two decades. She therefore recommends that education and training should prepare graduates for jobs of the future and must be ongoing in order to ensure employees stay relevant and keep up with the rapidly changing demands of the modern workplace. The interviews further revealed that all the 12 respondents (100%) prefer multi-skilled technical staff with expertise in more than one field, for example, fitters with knowledge in welding, machine operators with knowledge in maintenance and electricians with knowledge in electronics.

### Assembly sector

The assembly sector comprised companies which mostly

**Table 6.** Summary of the skills status in the plastics and packaging sector.

<b>Plastics and packaging industry</b>	
<b>Skills demanded</b>	<b>Skills supplied</b>
Machine operators (for the injection, blow moulding and extruder machines); Plastics printers; General fitters (with skills in new production technology); Boiler machine operators; Welders; Plastic products designers; Plastics packaging technicians; Laboratory technicians (with skills in plastics technology); Mechanical engineering technicians (with skills in new technology machine); Electrical engineering technicians; Refrigeration technicians; Mechanical engineers; Electrical engineers; Procurement specialists	Extruder machine operators; Plastics printers; General fitters; Boiler machine operators; Welders; Plastics packaging technicians; Laboratory technicians; Mechanical engineering technicians; Electrical engineering technicians; Refrigeration technicians; Mechanical engineers; Electrical engineers
<b>Skills not supplied</b>	<b>Skills supplied but not adequate in quality and quantity</b>
Plastic products designers; Plastics packaging technicians; Instrumentation	Steam boiler operators; Machine operators (for the injection, blow moulding and extruder machines); General fitters (with skills in new production technology); Laboratory technicians (with skills in plastics technology); Mechanical engineering technicians (with skills in new technology machine); Electrical engineering technicians; Multi-skilled technicians; Procurement specialists; Flexographic printing skills; Quality management skills

**Table 7.** Skills shortages in the plastics and packaging sector.

<b>Skills area</b>	<b>TQF level</b>	<b>Shortage of experts</b>
General fitters	3	12
Machine operators	3	12
Steam boiler operators	3	12
Plastics products designers	4	6
Plastics packaging technicians	4	6
Laboratory technicians	4	12
Mechanical engineering technicians	4	6
Electrical engineering technicians	4	6

assemble products or import finished products. The organisations include new car dealers, construction equipment dealers, steel products suppliers, suppliers of construction materials. Some of these companies also provide after-sales service for their products as well as old parts replacement. Few of the companies provide manufacturing services for trailers and fuel tankers, and they do designing, steel work, assembling, auto-electric works and painting of these mobile products.

All the 16 interview respondents in the sector (100%) indicated that they need the services of welders and painters while 10 of them (representing 63%) require automobile mechanics at the operative and artisan levels. At the technician level, all the 16 respondents (100%) indicated that they use assemblers, mechanical engineering technicians, automobile electricians and electronics technicians. At the specialist level, all the 16 respondents (100%) registered the need for mechanical engineers and electrical engineers while 10 respondents

(63%) indicated that they require automobile designers at this level. Baah-Boateng (2013) notes that a common feature of African economies is low productivity in all sectors on account of poor labour quality which results in slow structural economic transformation. According to the questionnaire results, the summary of the skills situation in the assembly sector is provided in Table 8.

All the 16 questionnaire respondents (100%) indicated that the sector is deficient of experts such as mechanical engineering technicians, mechatronics technicians, mechanical engineers with knowledge in machine installation and computerised engineering. Ten of the respondents (63%) further stated a lack of mechatronics engineers as well as automobile designers with knowledge of modern designing softwares like pro-engineer. They added that although welders, assemblers and painters are available on the local market, the quality of their skills is quite low. The disparity in the skills demand and supply in sub-Saharan Africa has largely

**Table 8.** Summary of the skills situation in the assembly sector.

<b>Assembly industry</b>	
<b>Skills demanded</b>	<b>Skills supplied</b>
Welders; Painters; Automobile mechanics; Assemblers; Mechanical engineering technicians (with modern machine technology); Auto-electricians; Electronics technicians; Mechanical engineers (with knowledge in machine installation, trouble shooting and computerised engineering); Electrical engineers; Automobile designers; Sales and marketing personnel (with practical knowledge of the profession)	Welders; Painters; Automobile mechanics; Assemblers; Mechanical engineering technicians; Auto-electricians; Electronics technicians; Mechanical engineers; Electrical engineers; Automobile designers
<b>Skills not supplied</b>	<b>Skills supplied but not adequate in quality and quantity</b>
Instrumentation technicians; Mechatronics engineers; Automobile designers (with knowledge of latest designing softwares like pro-engineer)	Mechanical engineering technicians (with modern machine technology); Mechatronics technicians; Mechanical engineers (with knowledge in machine installation, trouble shooting and computerised engineering); Advanced welding skills (particularly MIG , TIG and Gas welding); Competent assemblers; Sales and marketing personnel (with practical knowledge of the profession); Communication skills; Supervisory skills; Managerial skills; Marketing research skills

**Table 9.** Skills shortages in the assembling sector.

<b>Skills area</b>	<b>TQF level</b>	<b>Shortage of experts</b>
Mechatronics technicians	4	12
Mechanical engineering technicians	4	16
Mechanical engineers	Undergraduate	8
Mechatronics engineers	Postgraduate	8
Automobile designers	Postgraduate	8

been attributed to limited improvement of educational infrastructure and low investment in education due to lack of political will (Baah-Boateng, 2013).

In comparison, the South-East Asian countries of Malaysia, South Korea and Singapore have focused their priorities and commitments towards education and training to enhance the supply and quality of the human capital base. This has resulted in a significant gap in the economic growth rate between the two regions over the past few decades.

Additionally, six of the interview respondents (38%) pointed out that qualified sales and marketing personnel with practical knowledge of the profession are hard to find locally. Details of the skills shortage are given in Table 9. Table 9 indicates a shortage of experts from Level 4 and beyond. During the interviews, 12 respondents (75%) observed that a majority of the technicians and engineers perform well in their field-specific responsibilities but possess limited communication, supervisory and managerial skills. These experts fail to effectively manage personnel within their sections as evidenced by low performance levels.

The 12 respondents therefore suggested that training

institutions need to develop new courses in communication skills for technical staff (middle-level management), leadership and managerial skills for technical staff as well as market research. Furthermore, 10 respondents (63%) also recommended the inclusion of new courses on advanced welding, machine installation including trouble shooting, computerised engineering, modern machine technology, mechatronics and motor vehicle designing covering relevant softwares like Pro-engineer. For example, in a study conducted by Aring (2012), the global heavy equipment manufacturer Caterpillar singled out the skills gap as their major challenge and indicated that they would need 7000 new technicians in countries where the education system is very weakly developed. She further observes employers from Ghana, Senegal, Egypt, Namibia, Botswana, and South Africa all stress a serious problem with skills gaps, noting gaps in the basic skills and entrepreneurial skills of young people.

All the 16 interviewees (100%) also proposed that technician and engineering training programmes should include the use of modern machines and their technology during practical sessions to ensure that the graduates

possess relevant skills to the industry. In line with this suggestion, Trocko (2015) notes that the demand for graduates with degrees in science, technology, engineering, and mathematics has significantly increased in recent years unlike that for liberal arts graduates. In the USA, for example, only 15 percent of the college graduates hold degrees in these majors despite an increase in their demand.

## Conclusion

The study has revealed a scarcity of expertise in various fields in the manufacturing industry in Malawi, with some organisations out-sourcing labour on the international market. In some cases, there are no educational institutions providing training in certain fields and in others the graduate output is far inadequate to meet industry demand. The depth of content is also low in fields such as automobile engineering (designing and assembling).

The study also pointed out low quality of experts in popular trades such as welding and fabrication, mechanical engineering, electrical engineering and food technology. It further indicated that training institutions need to begin producing multi-skilled technicians who would be capable of performing multiple functions in the organisations. It was observed, for instance, that most of the electricians on the market are only trained in electrical installation but have little knowledge of electronics.

In all the four sectors of the manufacturing industry, it was further revealed that the technical experts at all levels possess limited supervisory and communication skills. The study showed that companies are affected by the inability of supervisors and foremen to effectively lead and manage people under their authority. On the mismatch between the demand and supply of skills, the study revealed weak linkage between the industry and research and training institutions. This disconnect has resulted in a technological gap between what is being taught in school and what is currently in use in the industry.

Based on the findings, the study recommends that new programmes should be introduced in the fields where no training is currently available in the country. Some existing programmes also need revision to incorporate new courses which would reinforce the curriculum to make the courses more relevant. The reviews would further allow specialisation in areas demanded by the industry. Programmes at the operative, artisan and technician programmes should encourage multi-skilling by allowing students to specialise in any two closely-related areas. Multiple specialisation is more pertinent at the present time when organisations are trying to optimise the potential of their existing staff to maintain lean structures. However, this can only be achieved if parallel initiatives are put in place to build the capacity of existing technical colleges for them to be able to

effectively institutionalise.

The development and review of these programmes can be phased out over a number of years depending on availability of funding. Where funds are not permitting, the process could begin with developing new programmes at the technician level where there is currently a critical shortage of personnel. Furthermore, the government as well as private sector need to work together with research and training institutions in the development of the new programmes. The four sectors need take a leading role in assisting research and training institutions with the necessary resources for them to develop programmes on demand in their individual sectors. An industrial liaison body could also be established to facilitate partnerships which would enable the industry to work closely with research and training institutions in the introduction of relevant programmes.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

## ACKNOWLEDGEMENTS

The author appreciates the Ministry of Industry and Trade in Malawi for initiating this study. His profound appreciation also goes to all the organisations that participated in this study, including other government ministries and departments. Special gratitude also goes to the European Union for the financial support that was rendered towards this study.

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