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**SKILLS TRAINING IN ENGINEERING COURSES IN  
INSTITUTES OF TECHNOLOGY AND THE LABOUR MARKET  
REQUIREMENTS IN KENYA**

**BY**

**CHARITY M. LIMBORO**

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## DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

 Date 15/06/2012

**Charity Mukiri Limboro**

Reg. Number: E83/10569/07

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This thesis has been submitted with our approval as University supervisors:

 Date 12/06/2012

**Prof. Grace Bunyi**

Associate Professor,

Department of Educational Management, Policy and Curriculum Studies

Kenyatta University

 Date 18-06-2012

**Prof. Jotham Olemba**

Professor,

Department of Educational Management, Policy and Curriculum Studies

Kenyatta University

## DEDICATION

This thesis is dedicated to my parents, the late Peter M'Limboro and Zipporah Naita M'Limboro; and my children, Michelle Mwendwa, Collins Kithinji and Danielle Mukami.

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## ABBREVIATIONS AND ACROYNMS

EEC	European Economic Community
EHE	Enterprise in Higher Education
ILO	International Labour Organization
IT	Institutes of Technology
KIE	Kenya Institute of Education
LMI	Labour Market Information
M.A	Master of Arts
M.Ed	Master of Education
MOEST	Ministry of Education Science and Technology
MOLHRD	Ministry of Labour and Human Resource Development
NCEOP	National Committee on Educational Objectives and Policies
NCKK	National Christian Council of Kenya
NGOs	Non-governmental Organizations
NICs	New Industrialized Countries
NPs	National Polytechnics
OD	Ordinary Diploma
SPSS	Statistical Package for Social Sciences
TEP	Technical Education Programme
TIQET	Totally Integrated Quality Education and Training.
TIVET	Technical, Industrial, Vocational and Entrepreneurship Training.
TTIs	Technical Training Institutes
TVE	Technical and Vocational Education
UNESCO	United Nations Educational, Scientific and Cultural Organization
VPs	Village Polytechnics
YPs	Youth Polytechnics

## ABSTRACT

Kenya has set an ambitious goal of becoming industrialised by the year 2030. The availability of well educated and relatively well trained workforce is regarded as critical to industrialisation. To achieve this goal, Technical, Vocational, Education and Training (TVET) institutions are charged with the major responsibility of preparing trainees with relevant knowledge and skills required in the labour market in order to enhance their productivity. Although the Government of Kenya has been expanding education and training institutions for more than 40 years, there has been an underlying worry that education and training have not translated into the economic gains associated with education. It is against this background that the study investigated the relevance of knowledge and skills acquired at the Institutes of Technology (IT) to the needs of the labour market. The current study focused on the three engineering courses namely: Building and Civil Engineering, Electrical & Electronics, and Building and Civil Engineering. The study adopted the case study approach and used both quantitative and qualitative data collection and analysis techniques. This study was carried out in the Institutes of Technology in the former Nyanza and Central Provinces and selected industries in the city of Nairobi. The research involved four Institutes of Technology and 15 companies. The sample size of the study consisted of 173 respondents including 130 graduates, 12 lecturers, 12 heads of department, 3 lecturers in-charge of industrial attachment, 15 supervisors and the officer in-charge of curriculum for IT at Kenya Institutes of Education. Data was collected using a questionnaire, interview guides, and an observation schedule. In addition, documentary analysis that entailed reading through documents was used as a strategy of data collection. Statistical Package for Social Sciences (SPSS) computer programme was used to analyse quantitative data while qualitative data was analysed according to themes derived from the research questions. The findings of the study revealed that there was an education and training gap, suggesting that the Institutes of Technology did not adequately prepare the graduates with the knowledge and skills needed in the labour market. The Technical Education Programme (TEP) curriculum was outdated as it had not been reviewed since its inception in the 1980s, and there was little involvement of the industry in the development and review of curriculum. More so, the equipment at the Institutes of Technology were inadequate, outdated or broken down. As a result, the graduates required further training upon employment to equip them with the skills on how to handle modern equipment in industry. Further, the study found out that IT were faced with very many challenges such as lack of sufficient funds, lack of industrial exposure by the lecturers, ineffective industrial attachment programmes for the trainees and inadequate professional qualifications for the lecturers. The study recommends that there is need to analyse the TVET modular curriculum awaiting approval from the Ministry of Higher Education and Kenya Examinations Council to ensure that it is relevant to the needs of the labour market. The involvement of key persons from the industry in curriculum review and development would be necessary to ensure that the graduates have employability skills. The Ministry of Higher Education needs to ensure that the facilities being used at the IT are up-to-date and/or the IT should make arrangements for simulation exercises or to share facilities at the workplaces during training. Teachers Service Commission (TSC) should grant leave with pay to lecturers willing to upgrade their professional qualifications. Trainees' industrial attachments should be well coordinated to ensure that they benefit from them maximally. Lastly, IT need to provide opportunities for staff to gain exposure and experience in the use of new tools and equipment used in the labour market.

# CHAPTER ONE

## BACKGROUND TO THE STUDY

### 1.1 Introduction

This chapter highlights the background and context of the study, statement of the problem, objectives of the study, research questions, significance of the study, scope, limitations and delimitations of the study, assumptions of the study, theoretical and conceptual framework, and definition of significant terms used in the study.

### 1.2 Background to the Study

The tremendous success of industrialisation in raising living standards of the developed countries during the nineteenth and early twentieth centuries has engendered a belief that industrialization is a prerequisite for economic development (Ogbimi, 2007; Talsim, 2010). Indeed, according to Wade (2003) and Marti & Ssenkubuge (2009), industrialisation plays a major role in the economic development of underdeveloped countries as it creates job opportunities, facilitates links across service and agricultural sectors and between rural and urban economies and spurs technological advancement and innovation as well as productivity gain. As such, industrialisation is an instrument in poverty eradication (UNDP, 2005; Ogbimi, 2007; Marti & Ssenkubuge, 2009).

With more than a billion people living in poverty globally, the need for industrial development in poor countries is more than ever acute (Ogbimi, 2007). It can be argued that the main emphasis on the urgent need for rapid industrialisation by developing countries is in no doubt motivated by the desire to create employment and reduce poverty by accelerating economic growth.

According to Kim (1997), it is the conscious accumulation of human resource that has enabled Newly Industrialized Countries (NICs) to acquire the necessary capability and innovative capacity which in turn has greatly enhanced their value added in manufacturing. This has enabled them to participate competitively in international export markets in areas such as ship - building and the manufacture of automobiles, textiles, electronics and semi - conductors. The implication here is that education and training are critical factors in economic development (Mokyr, 1990; Romer, 1990; Rebelo, 1991; Joubert, 1992; Lall 1992; Barro, 1996 and Kim, 1997; 1999). The question that should be asked is, 'What type of education and training is most needed and effective to spur industrialisation and economic development in developing nations?'

In Maredia's view (2007), it is developing and implementing curriculum and teaching programmes that are relevant to the world of work that can make education and training responsive to the needs of the labour market. Maredia further asserts that a relevant curriculum prepares trainees for life in specific local environments and beyond and as such a relevant curriculum should be guided by the dynamic nature of life in relation to unprecedented changes in science and technology. In addition, he says, that the curriculum should be dynamic and demand driven if TVET training is to serve the needs of the labour market.

On the other hand, curriculum deals with context relevance (Tyler, 1949, Bonser and Grundy, 1988). These authors emphasize the need for curriculum to be relevant to the social and economic needs of a country normally stated in the form of development goals. The hypothesis here is that the stated goals are a true reflection of what the society expects from the education system. A curriculum that links work and skills requires a detailed understanding of the major changes in the world of work in recent years. This

must take account of the nature of changes at the global, national and local levels and the opportunities that exist at each level for skills interventions that can support successful economic activities.

The relevance of formal technical training ought to be reflected in the job performance of graduates. If the graduates are able to perform the tasks expected of them in the labour market, then they can be said to possess the relevant skills required. To the training institutions, relevance may mean the extent to which the training objectives are met while according to the labour market, it means the extent to which training institutions have equipped the graduates with appropriate knowledge and skills the market requires. This study sought to find out the relevance of knowledge and skills acquired at the Institutes of Technology to the needs of the labour market.

According to Ogbimi (2007), education equips the individual with theoretical knowledge and develops a ready and sound mind and character. Training on the other hand complements education by preparing the individual for work and life. Therefore this means that any effort aimed at promoting education and training, should link the two to the world of work to ensure that the graduates have the skills required in the labour market. As a result, the graduates would be productive and this would lead to high productivity in industries and hence rapidly transform developing nations into industrialised nations. In this respect, the Government of Kenya acknowledges that the country cannot industrialize without accumulation of an adequate pool of relevantly skilled human resource at all levels (Republic of Kenya{R0K}, 1999; Ngerechi, 2003, Kaane, 2004).

The role of technical vocational education and training (TVET) institutions in preparing technically skilled human resource for the labour market cannot be overemphasized. One of the most important features of TVET is its orientation to the world of work and the emphasis of the curriculum on the acquisition of practical skills for wage employment or self employment. Technical Vocational Education and Training relates to a specific trade in which the learner participates, hence the term vocational, while technical means that the learner directly develops expertise in a particular group of techniques (Tum, 1996). As a result, TVET has been used by several developed and developing countries as an instrument of development.

For a long time, the Kenyan government had relied on agriculture as a backbone in the achievement of economic growth. However, recently Kenya has set an ambitious goal of becoming industrialised by the year 2030 (RoK, 2007) and, like many developing countries seeking to industrialise, Kenya has embraced the industrialisation goal as a means of achieving structural transformation of the economy. Concomitant with this developmental strategy is the need for skilled human resource. Technical Vocational Education Training in this context is critical in the development of skills that support achievement of the said objective. Global evidence shows a close relationship between TVET, employment and economic growth.

Skills development through TVET system has been identified as the most appropriate mechanism that can lead to industrialization (RoK, 1999; 2007). According to Kenya Vision 2030 (RoK, 2007), relevantly trained human resource will play a major role in contributing not only to efficiency gains in existing economic activities but also in diversifying economic sectors and activities in order to realise productivity gains. This is important because Kenya's business environment is characterised by a large number of

micro and small enterprises (MSES) which account for roughly 75% of total employment and an estimated 18% of Gross Domestic Product {GDP} (RoK, 2007).

Currently, Kenya's development goal as elucidated in Vision 2030 is industrialisation by the year 2030. This suggests that TVET delivery systems should be well placed to train the skilled workforce that the country requires to industrialise and thereby create wealth and reduce poverty. The Global Employment Agenda (2003) and the ILO Declaration on Social Justice for a Fair Globalization (2008) highlight relevant skills development as central to improving productivity, job creation and standards of living. This is because a workforce that has been appropriately trained and is able to continue learning boosts investor confidence and thus job growth.

Unfortunately, in Kenya, despite the high number of technical training institutions in the country, there is little research on the relevance of knowledge and skills attained by the graduates to the needs of the labour market. However, there has been a heavy criticism by employers that TVET institutions are producing graduates with irrelevant skills required in the labour market.

In the year 2001, the Federation of Kenya Employers accused Kenya's technical vocational education and training institutions of producing graduates equipped with skills that are irrelevant to the needs of the industries. These institutes were accused of being slow to adapt to new technology, forcing companies to train their own staff (Daily Nation, 22/10/2001). Aduda (2002) reported that due to financial problems, TVET institutions were unable to acquire new equipment or upgrade the existing ones and offer saleable skills. Thus, the students are trained using obsolete equipment which put them at

a disadvantage when they join industry where technology is the in - thing. The foregoing criticisms are, however not based on any research findings. All the same, they suggest a need to investigate the relevance of knowledge and skills acquired from TVET institutions to the needs of the labour markets.

Most studies conducted in the area of TVET have tended to focus on the 8.4.4 secondary school curriculum and its relevance to the job performance of the school leavers (Ogutu, 1986; Shiundu, 1986; Kemunto, 1996; Mwiria, 2002). Other studies on TVET as seen in Orodho (1984); Owano (1988) and Opiyo (2010), have also primarily concentrated on the youth polytechnics and other technical training centres with specific focus on the role of these training institutions to social-economic development. This indicates a notable gap in what is known about the match between the skills acquired at the Institutes of Technology and skills required in the labour market.

### **1.3 Statement of the Problem**

To industrialise, Kenya has identified TVET as a strategy to achieve this goal. However, over time there have been criticisms that TVET institutions in Kenya are producing graduates with irrelevant skills required in the labour market. While there has been strong criticisms of the relevance of skills acquired at the TVET institutions to needs of the labour markets, little research exists in support of these criticisms. There is a dearth of knowledge that exists to demonstrate whether the Institutes of Technology (IT) graduates are well prepared for the labour market. The researches that are available seem to focus mainly on the relevance of knowledge and skills acquired by the graduates of the 8.4.4 system of education (secondary education) or the Youth Polytechnics. Specifically, there has been little studies focused particularly on Institutes of Technology and hence

the need for this study.

#### **1.4 Purpose of the Study**

The purpose of this study was to investigate the relevance of education and training acquired by IT engineering graduates vis-à-vis the needs of the labour market.

#### **1.5 Objectives of the Study**

The specific objectives of this study were to:

- 1) Establish the relevance of Technical Education Programme (TEP) engineering curriculum to the needs of the labour market.
- 2) Identify the relevance of knowledge and skills acquired by engineering graduates from the Institutes of Technology to the needs of the labour market.
- 3) Identify the challenges facing Institutes of Technology in their efforts to prepare engineering trainees for the labour market.

#### **1.6 Research Questions**

The study sought to answer the following research questions:

- 1) How relevant is the Technical Education Programme (TEP) engineering curriculum to the needs of the labour market?
- 2) How relevant is the knowledge and skills acquired by engineering Institutes of Technology graduates to the needs of the labour market?
- 3) What challenges are encountered by the Institutes of Technology in their efforts to prepare engineering trainees for the labour market?

#### **1.7 Significance of the Study**

The role of technical education and training in economic development cannot be over emphasized. It is anticipated that the findings presented in this study may serve as a

source of reference to guide curriculum developers in designing a curriculum that is relevant to the needs of the labour market. In Kenya, this study is significant because it is closely related to Kenya's Vision 2030 that lays emphasis on the role of TVET institutions in preparing technically skilled human resources required at all levels of the economy. Since Kenya plans to industrialise by the year 2030, it is expected that the findings of this study would give practical strategies for promoting quality and relevance TVET that can lead to achievement of industrialisation. Further, the findings of this study would add to the pool of knowledge on TVET in Kenya.

### **1.8 Limitations of the Study**

Graduates of IT comprised a key sample for the study. Tracing the graduates proved to be a daunting task. Of the 270 engineering IT graduates earmarked for the study, the researcher was able to trace 130 working in industries.

Further, owing to financial and time constraints as well as logistical challenges, the study was conducted in only four IT and only on pure technical courses (Mechanical and Automotive engineering, Building and Construction engineering, and Electrical and Electronics engineering) which comprise only one segment of TVET programmes. In addition, industry-based data for the study was collected in only a few manufacturing and service industries that are the main employers of pure technical courses IT graduates within the city of Nairobi.

### **1.9 Delimitations of the Study**

This study was confined to TVET engineering graduates from institutes of technology employed in urban industries in the city of Nairobi. While the researcher appreciates the

importance of IT engineering graduates working in other towns or engaged in self employment, this study did not involve them.

There are many strategies that have been put in place by the government towards the achievement of Vision 2030. However, this study focused only on the role of education and training in Kenya towards the achievement of vision 2030.

### **1.10 Assumptions of the Study**

In this study, it was assumed that technical training institutions have a close linkage with industry and that the institutes have the capacity to equip the trainees with the knowledge and skills required in the labour market. In addition to this, it was assumed that heads of departments, lecturers, graduates, employers and all the respondents in general considered effective technical education and training as critical in producing relevantly trained human resource at all levels of the economy if the country was to achieve Newly Industrialised Countries (NIC) status by 2030. In view of this, it was assumed that all the respondents appreciated the study and were in a position to respond positively by providing the relevant information that would help to generate evidence to sufficiently address the statement of the problem.

### **1.11 Theoretical Framework**

This study is guided by the systems theory. The systems theory often traced to Von Bertalanffy (1968), emphasizes that real systems are open to, and interact with their environments, and that they can acquire qualitatively new properties through emergence, resulting in continual growth. According to Finch and Crunkilton (1999), a system is an organized collection of parts that are highly integrated to accomplish an overall goal. A

system is, therefore, perceived as having various inputs, which go through certain processes to produce certain outputs, which together, accomplish the overall desired goal for the system.

Systems have different levels of operation: open or closed. Open systems interact with their environment while closed systems do not. A system, such as a training institution is an open system since it interacts freely with its environment (stakeholders, customers, and government). In general, all organisations can be viewed as open systems which take up inputs from the environment and through a series of activities and convert these inputs into outputs to achieve a certain objective (Owen, 1998).

In the context of the system theory, a training institution for instance takes up resources such as personnel, finances, materials and information and converts them and returns them to the environment (society) in the form of changed individuals. This is what makes a training institution an open system.

Von Bertalanffy (1968) viewed the systems theory as a high level abstraction that can be used as a working hypothesis whose function is to provide a theoretical model for explaining, predicting and controlling a phenomenon. 'Systems' thinking is, therefore, a theoretical approach to understanding a phenomenon through investigation. According to Owen (1998), the systems theory is viewed as an input –process-output system or as an input output production model that consists of five elements. These elements are: input, output, process, environment and feedback. Using this model, it is possible to analyse an organization in terms of whether it is meeting its set objectives or not. This is because all organizations need clear aims and objectives which determine the nature of inputs, the

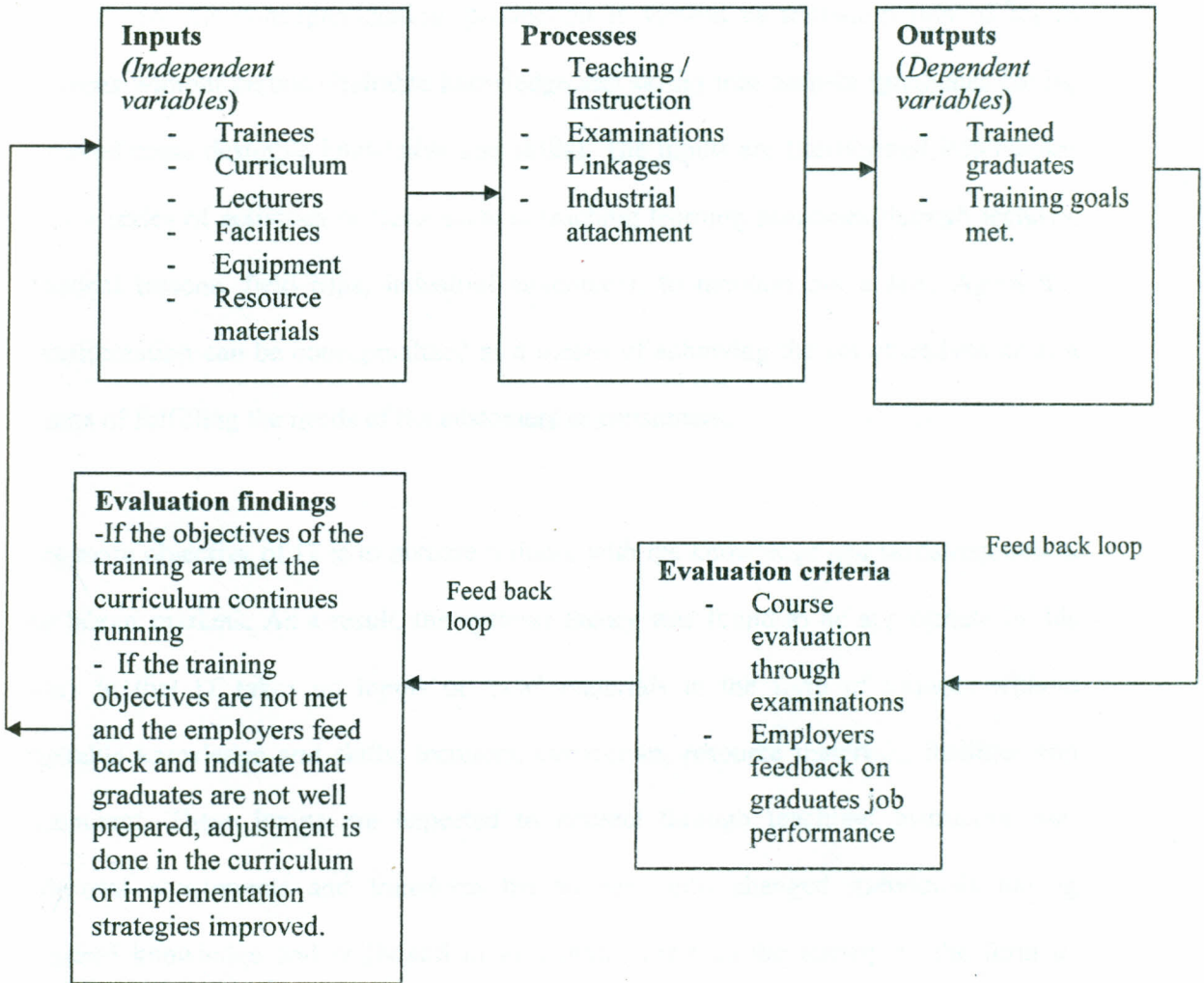
series of activities to achieve outputs and the realization of organizational goals. Feedback about the performance of the system and the effects of its operation on the environment are measured in terms of achieving the objectives.

The input- output production model is a process that involves conversion of raw materials through some process into products ready for use by the consumers. Production process in any industry, is therefore, a theoretical construct based on the production function, which describes the physical relations between the industry's input of resources and the output produced. In this study, input-transformation-output model of the systems theory is used to analyze Institutes of Technology in terms of whether or not they are achieving their set objectives.

Blaug (1969) indicates that in the production process, a firm is the basic unit of economic production, which utilises a variety of inputs to produce output(s). In this study therefore, based on the theory of production, Institutes of Technology are perceived as industries that use a multiplicity of inputs to produce outputs. This means Institutes of Technology are equated to enterprises which take "raw materials" (trainees) other inputs (trainers, curriculum, resource materials, facilities and equipment) which interact through the processes of teaching/instruction (lectures, practicals in the laboratories and workshops, research based projects, field trips and industrial attachments) to produce certain learning outcomes.

## 1.12 Conceptual Framework

Figure 1.1 depicts how a training institution as system that can be analysed based on the systems theory.



Applying the systems theory to find out whether the Institutes of Technology are producing graduates with knowledge and skills required in the labour market, it requires that we ask questions such as:

- Does a measurable criterion exist for all feedback loops so the feedback can be evaluated?
- Are system goals and objectives congruent and defined well enough to help identify important inputs and guide the criteria for evaluating feedback?

In this conceptual model, IT are perceived as producers of technically trained human resources in the same way industries or firms take inputs in the form of raw materials and through some processes transform them into finished goods demanded by the labour market. In this conceptualization, production is viewed as transformation of inputs (trainees without certain desirable knowledge and skills) into outputs (graduates having acquired some desirable knowledge and skills). The inputs are transformed into outputs after a series of activities or tasks such as teaching learning processes through lectures, practical lessons, field trips, industrial attachment, to mention but a few. Again this transformation can be conceptualized as a means of achieving the set objectives or as a means of fulfilling the needs of the customers or consumers.

One main objective of IT is to prepare trainees with the knowledge and skills required in the labour markets. As a result, the systems theory was found to be appropriate in this study in that IT takes up inputs or 'raw' materials in the form of trainees without desirable knowledge and skills, lecturers, curriculum, resource materials, facilities and equipment. These inputs are expected to interact through teaching/ instruction and industrial attachments and transform the trainees into changed individuals having acquired knowledge and skills and in turn return them to the society in the form of changed individuals, able to serve themselves and the community.

It is assumed that if these inputs, for example, (i) the curriculum is relevant to the needs of industry, (ii) the trainers are adequately trained in their areas of specialization and have adequate industrial exposure, (iii) there is provision of adequate physical facilities, up-to-date modern equipment and facilities, and (iv) enough and quality resource materials, then this should lead to the desired outputs which in this case are highly skilled graduates at all levels with relevant skills that meet labour market requirements for personal

development and industrial take-off.

After evaluation, if the findings indicate that the training institutions have met their objectives and that the employers are satisfied with job performance of the graduates, then the curriculum can be said to be relevant and hence can continue running. However, if the examination results indicate that the training objectives have not been met, and in addition the employers are dissatisfied with the graduates' job performance, then this would call for urgent measures to be taken to address or rectify the situation. Depending on the actual problem/weaknesses identified, different actions such as improvement of the implementation strategies, curriculum review or change may be undertaken as is appropriate.

### **1.13 Definition of Significant Terms**

**Artisan:** Refers to a person who is a skilled primary school leaver with thorough knowledge of techniques which are needed to do a job with efficiency in a specific trade.

**Craftsperson:** Refers to a skilled secondary school graduate having trained at the certificate level in a specific trade who has the ability to do a practical job or work at a higher level of efficiency than an artisan.

**Industrial Development:** Refers to the cumulative increase or qualitative and quantitative multiplication of productive processes in an economy.

**Industrial Education:** Refers to a general form of education about industry that imparts knowledge, skills and appropriate attitudes towards the process of industry.

**Relevance:** Refers to the extent to which the education and training at IT is oriented to the labour market needs.

**Technical Education:** Refers to the range of programmes that impart skills, knowledge and attitudes to individuals preparing to take middle level professional positions in the labour market, particularly in engineering and scientific disciplines.

**Training:** Refers to the process of instruction and learning which prepares a person to do a specific task or set of tasks such as those which make up a particular job or occupation.

**Vocational Education:** Refers to those programmes that impart specific occupational skills and knowledge required in the labour particularly in engineering and science disciplines.

**Technician:** Refers to a person who has the ability to perform a wide range of skilled and analytical tasks at a high level of competence.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

Review of related literature in this study is divided into five main sections. The review highlights existing gaps in research and knowledge related to the problem of this study. The first section assesses the role of human capital in economic development while section two gives an overview of TVET from a global context. The third section reviews literature on the concept of relevance, while section four discusses linkages between training institutions and industry. Lastly, section five explores skills training and labour market requirements.

#### **2.2 Education and Economic Development**

The relationship between education and development has long been recognized in development literature. On the one hand, education is considered a crucial input into the development process and on the other hand, it is seen as a product that is worthy of pursuit by itself.

Education is acknowledged as a means for transforming and empowering communities (Afeti, 2008; Nyerere, 2009). The youth especially gain skills, knowledge and attitudes to enable them become productive members of the society. Existing empirical literature recognises human capital created through investments in education and the development of skills, as one of the most significant determinants of economic growth.

Practically, there are divergent views among researchers as to whether education and training have a negative or positive relationship with economic growth. Barro (1991)

finds a positive relationship between education and economic development while De Meulmester & Rochet (1995) conclude that the relationship between education and economic growth is not always positive. Benhabib & Spiegel (1994) acknowledge the human capital development as a source of economic development. Gemmell (1996) concludes that human capital and its growth rate as a main determinant of economic growth. However, Rodriguez & Rodrik (1999) point out that normally the instruments used to determine the relationship are not suitable. Hanushek & Kimko (2000) argue that quality education and training have a remarkable impact on productivity and national growth rates.

Barro & Lee (2010) find that education as measured by years of schooling completed by the adult population has a significant growth impact, if all things remain constant or all things equal. Similarly, Cohen and Soto (2007) find that both initial years of schooling and change in years of schooling have considerable positive impact on income growth in the world. Similarly, Martinez, Levine, Kelley, Saemundsson & Schott (2010) and Kamara, Bousrih & Nyende (2007) highlight increased tertiary education, especially, the production of scientific, technical, and entrepreneurial skills, as a way to accelerate growth in Africa. In addition, Gyimah-Brempong (2011), finds that education has a positive and significant impact on development outcomes and that different levels of education affect development outcomes differently in Africa.

A study in Pakistan by Kakar, Khilji & Khan (2011) on the relationship between education and economic development indicates that education and training have a long run relationship with economic development. Better standards of education and training enhance the productivity of the labour force and this leads to economic growth. This

suggests that quality education and training is essential to develop and increase the human capital abilities.

Over the past few decades, the Newly Industrialised Countries (NICs) in East Asia were able to transform their economies from agriculture-dominant traditional economies to industry-dominant modern economies by making tremendous progress in technological capability development (Kim, 1997, 1999; Westphal, 1990; Amsden, 1989, 1994; Lall, 1992, 1996; Ernest et al., 1998).

According to Growiec (2010) the growth effect comes through several ways such as; the ability to create and absorb new technologies, improved health, and increase in savings and investments. Toya, Skidmore & Robertson (2010) find a positive relationship between education and income growth in the world. Toya, Skidmore & Robertson argue that the positive and significant relationship remains unchanged whether education is measured in terms of years of education completed at all levels or years of secondary education completed.

Recent studies on the relationship between education and income growth have relied on new and improved data sets that cover more countries and dynamic panel or instrumental variables estimators. Most studies on the effects of education on development have used cross-country data and focused on the growth effects of education (Schultz, 1963; Barro, 1991, 1996, 1999; Romer, 1990; Atardi & Sala-i-Martin, 2003; Fukase, 2010; Nelson and Phelps, 1996; Gyimah-Brempong, Paddison and Mitiku; 2006; Ciccone & Papaioannou, 2009; Mamoon & Murshed, 2009). Others use cross-state data within a country (Baldwin and Borrelli, 2008) to investigate the effects of education on income growth.

Since most of the studies reviewed in this section focused on the role of general education to economic growth this study sought to investigate the relevance of skills acquired at the Institutes of Technology to the needs of the labour market and the potential of the IT graduates to spur Kenya into NIC status. In addition, whereas most of the studies reviewed were on large scale and used survey design, the current study was a case study of engineering courses in Kenya Institutes of Technology.

### **2.3 Technical Vocational Education and Training (TVET): The Global Context**

The role of TVET in furnishing skills required to improve productivity, raise income levels and improve access to employment opportunities has been widely recognized (Bennell, 1999; AU, 2007; Afeti, 2008; Mureithi, 2008). The Bonn Resolution of October 2004 noted that TVET is the “Master Key” for alleviation of poverty, promotion of peace, and conservation of the environment, in order to improve the quality of human life and promote sustainable development.

Several countries, developed and developing, such as Italy, Brazil, China, Sweden and Japan have given more recognition to TVET through adequate funding. As a result, students get exposed to vocational training and to a culture of scientific investigation and application at an early age. In Europe, at least 50 percent of the students in upper secondary education pursue some form of technical or vocational education. In China, India and South East Asia the figure is 35-40 percent, whereas in Africa it is less than 20 percent. According to Gachino (2006), the role of TVET is absent, to a large extent, in most policy documents in Africa. Further, Bennell (1999) points out that TVET has been accorded limited importance in donor financing schemes and discussions since the late 1980s. Inadequate funding for TVET contradicts governments and donor countries

consistent emphasize of the need for concerted efforts to build the human resource required by the country.

Technical Vocational Education and Training is increasingly recognised as an effective means of empowering young people to engage in productive and sustainable livelihoods (Bennell, 1999; UNESCO, Joubert 1992; 2005b & UNESCO-ILO, 2002). To this end, TVET programmes that respond to the needs of the labour market, both local and global, are viewed as central in equipping the youth with work skills that enable them to escape the vicious circle of poverty and contribute to the society's wellbeing.

Skill training is essential for sustainable economic development and poverty reduction in terms of creating a critical mass of technically and entrepreneurially qualified people, who are able to stimulate investment opportunities, create jobs and increase productivity. A well educated and trained workforce is a prerequisite for harnessing the potential of competitiveness and industrialization (Rao, 1996). A skilled workforce is a basic requirement for driving the engine of industrial and economic growth, and TVET holds the key to building this type of technical and entrepreneurial workforce (UNESCO, 2004a; AU, 2006; & Afeti, 2008).

There is a great variation in the way TVET is delivered across countries. Depending on each country, TVET can take place either in formal schools, post-secondary level or technical colleges, or informally by means of training at the workplace (UNESCO, 2004; AU, 2007; Afeti, 2008 and Mureithi, 2008).

From the industrialised and NIC countries, two training models in TVET stand out for mention: the dual system practised in Germany and the centralised Singaporean model. The Germany apprenticeship system of vocational training (popularly known as the dual system) has frequently been referred to as an example of excellent practice of technical vocational education and training (Beardwell and Holden, 2001). The German's dual system combines on-the-job training with theory taught in the training institutions one or two days per week. Large companies typically possess their own training schools but smaller companies provide practical training in group training centres shared by several companies. This way the trainees are able to acquire the necessary expertise that is required in the labour market. This study sought to find out the situation in Kenya.

Technical Vocational Education and Training system in Singapore follows a centralised planning model in which the needs of industry are closely matched to the outputs of the education system (George, 2006). In Singapore, a National Human Resource Council ensures that training is relevant to the needs of the labour market. Training also includes the inculcation of shared cultural values and attitude development. Research into the economic, industrial, education and skills training policies of newly industrialised countries such as Singapore, Taiwan, Hong Kong and Korea have revealed that vocational skills training is well organised (Afeti, 2008). In Singapore, these bodies are the Economic Development Board <sup>EDB</sup> (EDB), National Productivity Board (NPB) and the institute of Technical Education coordinating 90 apprentices' options covering the business, industry and service sector.

Again, education and human resource policies in Singapore ensures that graduates from TVET institutions have the necessary knowledge and skills required in the country by

tying education and training to support each phase of economic development (Law, 2005). In an attempt to make skills training relevant, content is increasingly selected not only for its relevance to a specific job but for “job cluster” as well as for the transfer to jobs from related area in industry. This suggests that graduates of TVET are multi-skilled so as to fit into the job cluster or transfer their skills from one job to the other. As a result, this has led to high productivity in industries leading to tremendous economic growth. What is the situation in Kenya? How relevant is content imparted at the IT to the needs of the labour market?

The Korean Manpower Agency (KOMA) is the national body which coordinates training at the vocational training institutes as well as the National Competency Training Centres. On the other hand in Hong Kong, the Vocational Training Council (VTC) is the coordinating body for vocational education and training sector. In Taiwan, Vocational education and Training is coordinated by Employment and Vocational training Administration (EVTA) (Joubert, 1992).

The national coordinating bodies found in the countries above are also involved in national skills testing, accrediting of training centres and promoting skills formation and a skills learning culture. This process has in turn enabled these countries to accumulate a pool of highly qualified technical, industrial and entrepreneurial human resources hence the attainment of middle level in-come status by countries such as Singapore and Taiwan in the 1980s (UNESCO, 1995). The question is whether there exists a nationally recognised body that coordinates TVET institutions in Kenya. And if there isn't one, could this be the main problem bedevilling this segment of education and training that is critical in skills development?

In Sub-Saharan Africa context, TVET systems differ from country to country and are delivered at different levels in different types of institutions, including technical and vocational schools (both public and private), polytechnics, enterprises, and apprenticeship training centres (Afeti, 2008). 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 (Afeti, 2008).

In all of Sub-Saharan Africa, formal TVET programmes are school-based. In some countries, training models follow those of the colonial power. In general however, students enter the vocational education pathway at the end of primary school, equivalent to 6 or 8 years of education in countries such as Burkina Faso and Kenya respectively, or at the end of lower or junior secondary school, which corresponds to 9 – 12 years of what is called basic education in countries like Ghana, Nigeria, Mali and Swaziland. In many of these countries, the vocational education track has the unfortunate reputation of being a dead-end, in so far as academic progression is concerned and fit for those pupils who are unable to continue to higher education (Orodho & Nishimura 1999; Ngerechi, 2003; Afeti, 2008, Mureithi, 2008).

Studies undertaken in Kenya, Uganda, Tanzania, Zambia and Malawi (Haan, 2001, Grierson 1997) showed that the relevance and quality of TVET offered in public institutions is affected by:

- Inappropriate training materials, inadequate supplies and high student dropouts which suggests that the relevance and quality of training is often low.
- Inability of graduates to perform the tasks for which they were trained.

- Budget cuts that curtail investment in modern equipment and maintenance leading to poor practical content.
- Lack of qualified staff with experience in enterprises. This implies that the trainers cannot keep abreast with modern technology.

These studies, though relevant to the current study, differ, in several ways: First, the studies were conducted more than a decade ago and, therefore this study is intended to find out whether things have changed. Second, those studies were on large scale since they cut across countries and in addition paid attention to all segments of TVET. In contrast, this study is a case study of IT that prepare graduates in the three engineering courses namely: Mechanical and Automotive Engineering, Electrical and Electronics Engineering; Building and Civil Engineering. Third, the studies were comparative in design-comparing countries whereas this study focuses only on a segment of TVET in Kenya.

Other studies undertaken in East and Southern Africa (Ziderman, 2002; and McGrath; 1996) are on private TVET training institutions. The findings from the studies assert that the quality of TVET in the private training institutions is affected further by the following factors:

- Most of the private training institutions concentrate on "light vocational skills, business, commercial and service courses" because of the high investment associated with technology based courses;
- Private training institutions usually employ more part-time instructors, pay them less, use bigger class sizes and economise on the use of facilities;

- The private training institutions usually enroll students left out by the public institutions;
- Many of the institutions are unregistered suggesting that they are likely to offer low quality training.

Unlike the studies by Ziderman (2000) and McGrath; (1996) the current study is focused on TVET public training institutions.

Despite the scenario, TVET systems in a growing number of countries in Africa are undergoing or have undergone promising reforms that are intended to build on the inherent strengths of the systems. The major reforms concern the setting up of national training bodies, and the enactment of laws to strengthen national vocational training programmes. This is mainly aimed at linking training to employment (either self or paid employment). This is critical because the ultimate goal of TVET is employment. As a result, TVET programmes therefore should be linked to the job market. In this way, the socio-economic relevance of TVET can be enhanced.

National training authorities have been set up in many countries, including South Africa, Botswana, Namibia, Zambia, and Tanzania. Ghana has also recently passed an Act of Parliament that establishes a Council for Technical and Vocational Education and Training (COTVET) whose overall responsibility is skills development in the country (AU, 2007, Afeti, 2008). In order to achieve greater coherence within the diverse TVET systems, some countries have established National Qualifications Frameworks.

For instance the South African National Qualifications Framework provides a mechanism for awarding qualifications based on the achievement of specified learning outcomes prescribed by industry. The framework allows for accumulation of credits and

recognition of prior learning, which promotes the culture of life-long learning (DoE and DoL, 2007; AU, 2007). As a result, TVET training in such countries is not a dead end. Employers also support TVET financially by paying a levy of 1 percent on enterprise payrolls (Afeti, 2008).

From the foregoing discourse, it is apparent that putting in place relevant policies and executing them plays a major role in getting the right type of TVET that serves the needs of the labour market. At the same time, it is important to take note of the ample time that is set aside for the practical training in German's dual education and training system, hence promoting linkage with labour market and ensuring that the graduates acquire relevant skills needed in the labour markets.

In Kenya, TVET trainees normally go out for industrial attachment for only three months and organizations do not play any role in funding TVET training. At the same time, organisations' influence in the running of TVET is almost non existence (Mureithi, 2008). Funding TVET is entirely a responsibility of the government and of parents/guardians of trainees. As a result, TVET institutions are poorly funded and this has a bearing on the facilities and equipment found in these institutions and this eventually affects the outputs.

Another aspect that is important in getting the right TVET system but has for long been ignored in Kenya is the creation of a national body to be in charge of TVET. Research has shown that National Coordinating bodies in the area of TVET are critical in ensuring that TVET training is relevant to the needs of the country and hence leading to industrialization. In Kenya, the 1970 – 1971 commission of inquiry highlighted the need for training to be managed under one umbrella body but this recommendation was not

implemented and therefore TVET in Kenya continues to be scattered under various government ministries and parastatals.

According to the Sessional paper No. 1 of 2005, having the management of TVET institutions under different ministries makes coordination of activities and maintenance of training standards difficult because it leads to duplication of efforts, conflict of jurisdiction, underutilization of available training facilities, wasteful and unnecessary competition and costly irrelevant training programmes (RoK, 2005). A number of TVET institutions, which were established through an Act of Parliament, offer their own examinations. Foreign curricula are examined by their respective examination bodies in their country of origin. Lack of a national examination body to standardize the examinations and certification has resulted in all sorts of certificates flooding the labour market. As a result, employers are questioning the quality of those graduating through the systems (Ngerechi, 2003).

Experience from best practices in TVET demonstrates that their strength lies in their effort to link skills training and the labour market. These countries such as Germany have ensured that there exists a strong linkage between the training institutions and the labour market. Consequently, this ensures that the graduates so produced have both adequate theoretical knowledge and hands-on-experience before they are released into the labour market. In addition, in Newly Industrialized Countries (NIC) such as Singapore and Hong Kong, TVET is a priority area that is well funded through the government and private partnership. On the other hand, these NIC countries have national bodies that coordinate TVET to ensure that the training institutions are preparing graduates with relevant skills required in the labour market. Consequently, this explains the economic

milestones that have been realised in countries such as Germany, Singapore and Hong Kong while Kenya lags behind.

## **2.4 The Concept of Relevance**

Development of human resource with relevant skills is central to attainment of national goals for industrial development (RoK, 2005). Since Kenya attained independence in 1963, education has been perceived as an avenue to guarantee a bright future for individuals and the country at large. The view has been that education should equip learners with the knowledge, skills and attitudes that would enable them to effectively participate in the world of work for personal and national development (Joubert, 1992, AU, 2007, Afeti, 2008). The Kenya government recognizes that attainment of sustainable development cannot be achieved without placing education at the core of national development agenda (MoEST, 2003).

If education and training is to be considered as one of the main factors contributing to the development of the individual and nation, then it should be relevant to the world of work. According to Lemke (1981), relevance may be considered from three perspectives. First, in relation to the quality of education, there is need to root it in national values in order to achieve cultural identity; Second, the strengthening of links between education and development; and third, the integration with the world of work and the new environment that is being created by the scientific technological revolution now affecting the lives of people.

According to Ashton, David, Green, James & Sung (1996), the acquisition of relevant skills is vitally important in terms of individuals, enterprises and economies. Skills enable individuals to be more productive, and workforce skills help industries be more

productive and profitable. Skills help national economies raise productivity and create wealth. A highly skilled human capital enables machinery and plants to be used more efficiently, hence raising the level of return on investments. The acceleration of technological change in the recent decades requires highly skilled workers. Technological change has shifted the relevant demand towards higher skills in the labour force (World Bank, 2002a). New technologies are skill intensive and there is need to train people with those technologies to enhance workers' productivity.

On attaining independence in 1963, the Kenya Government embarked on a wide spread expansion of the education infrastructure inherited from colonial masters especially at the secondary and tertiary levels. This expansion is an indication that the independent state had recognized education as a powerful tool for human resource development that could lead to national development. The government put more emphasis on expansion of higher education because of its significance in production of skilled human resource required in all sectors (Mwiria et al., 2007).

Issues of relevance and quality of education and training which have been the target of reform initiatives including the recommendations of four major public commissions on education and training (RoK, 1964; 1976; 1981; and 1988b) have not been satisfactorily resolved. Education and training have been accused of failing to satisfactorily produce an employable labour force because of a mismatch between what is learned in institutions and the requirements of openings in the economy (RoK, 1997). It seems that the needs of the learners and the society to provide required human capital is still not achieved.

In Kenya, Vision 2030 is the new development blue print covering the period 2008-2030 with the aim of making Kenya a Newly Industrialised Country (NIC) by 2030. Education

a major role in the country's projected economic growth of 10 percent per annum for the next 25 years as envisaged in Vision 2030 document. According to Vision 2030 (RoK, 2007) document, education and training is supposed to enhance labour productivity by equipping the trainees with the skills required in industry if the country hopes to industrialize within the set time frame. For education and training to produce human resource with relevant skills required in the labour market, there is need to address the issue of quality and relevance in education.

According to the Report of the Commission of Inquiry into the Education System of Kenya (RoK, 1999), relevance in education enhances quality. Related to relevance of the school curriculum is the quality of education and training which can be determined by, among other things, the availability of qualified and motivated teachers, a conducive environment for teaching and learning, including the curriculum and facilities. The quality and adequacy of resources like physical facilities, equipment, teaching and learning materials have a direct bearing on quality of the outputs as they determine how effectively the curriculum is implemented. Production of graduates with relevant skills cannot be achieved in the absence of factors that determine quality in education and training. The major question that arises from the foregoing discussion pertaining to this study is: To what extent does the Institutes of Technology produce engineering graduates with relevant skills required in the labour market?

Relevance is the extent to which the objectives and outputs of a training system meet a country's economic and social requirements. Quality of training can be compromised by many factors, including poorly trained and motivated lecturers, lecturers with insufficient work experience in industry, insufficient training materials and supplies, inadequate or poorly maintained equipment, poorly designed content (timetable based rather than based

on acquisition of skills and competencies), failure to assess trainees' performance through periodical examinations, and poor management of the training process, among others. The researcher hopes to establish the status of inputs in the Institutes of Technology and their implications to training and the outputs.

## **2.5 Linkages between Training Institutions (TIs) and Industry**

The primary objective of all technical and vocational education and training programmes is the acquisition of relevant knowledge, practical skills and attitudes for gainful employment in a particular trade or occupational area (Afeti, 2008). The need to link training to employment (either self or paid employment) is at the core of all the best practices and strategies observed world-wide (Afeti, 2008).

It is important to note that technical training institutions need a market for their graduates while the industries need the human capital (skilled labour) for their production process. This therefore calls for collaboration/linkage between technical training institutions and industry in order to avoid wastage. According to Singh et al. (1985) training becomes demand-driven when skills acquired are relevant to the needs of the industry.

The fundamental issue in skills development is the need to ensure that the outputs have the required skills in the labour market. In order to ensure that the courses are demand-driven, there is need for the training institutions and curriculum developers to work closely with industry. Participation by employers in articulating the skills required in industry is vital.

Lowe (1990) observes that the two world wars forced a much closer link between higher education and industry, He notes that the chemical industry was a particular beneficiary

of university expertise in the First World War while the development of radar and atomic energy were the most spectacular direct outcomes of the interlinking of industries and universities during the Second World War.

Wright (1990) and Jones (1990) observe that the view that industry and higher education should work more closely together had become part of the dominant conventional wisdom. The very idea of a work related higher education curriculum was on the agenda and in 1983, the UK government launched the Technical and Vocational Education (TVE) initiative which sought to make education of the 14-18 years old more relevant to the needs of the employers. In 1987, the UK government again launched Enterprise in Higher Education (EHE), which aimed at creating partnerships between higher education and employers, work related curricula, work experience for students and staff, enterprise teaching and learning styles, accreditation of personal effectiveness as well as academic achievement.

Lack of collaboration between workers, technical institutions (TIs) and industry can only be detrimental to the economy. Mcmay (1994) notes that part of the explanation for Britain's economic decline lay in the failure to establish appropriate collaborative mechanisms between educators and employers. Such mechanisms were needed to provide research support to strategic economic planning to identify training and development needs, and to train and update the work force in relevant competencies.

Kenya has also followed suit in trying to reconcile training and industry. In 1996, the Kenyan government observed that the higher level of performance and productivity demanded by a competitive industrial environment would require close collaboration

between technical institutions (TIs) and employers of labour in order to bridge the level of mismatch between output of graduates and skills demanded by the market (RoK, 1996). The government, in collaboration with the private sector, was committed to strengthening existing public technical and vocational institutes through curriculum development and improvement of facilities. However, it is the private sector which was expected to take increasing responsibility for industrial training and retraining. The government, in conjunction with the private sector, was in the process of developing a national skills training strategy whose objective was to put in place a national system of skills training in Kenya in light of the current and future needs of the economy.

The above sentiments about the need for collaboration between training institutions and industry were echoed again in 1988 when the government launched the Sessional Paper on Education and Manpower Training for the Next Decade and Beyond (RoK, 1988). The Sessional Paper stated that education and training would be utilized to provide relevantly trained human resource required by the national economy. Similarly, the Report of the Commission of Inquiry into the Education System of Kenya (RoK, 1999) puts emphasis on the need for active and continuous collaboration between training institutions and industry in order to ensure harmony and relevance between skills acquired during training and the skills required in industry. This study sought to find out if the Institutes of Technology offering engineering courses have strong linkages with industry.

## **2.6 Skills Training and Labour Market Requirements**

In the 1970s, the informal sector in Kenya emerged to supply basic goods and services to the members of society who found it increasingly difficult to afford the goods and services available in the formal sector (RoK, 1981). As a result of this demand, informal

and/or formed their own businesses and took in apprentices. In 1971, on-the-job industrial training was recognized through the establishment of the Directorate of Industrial Training (DIT). It is at this point in time that Youth Polytechnics and 'Harambee' Institutes mushroomed across the country. The graduates from these institutions were expected to be self employed in the rural areas.

However, a decade later, studies started to reveal that the Youth Polytechnics and 'Harambee' Institutes of Technology were not doing as well as expected. A study by Action Aid in Kenya in 1982 (cited in RoK, 1997) pointed out that youth polytechnics were offering essential services to rural communities through training and provision of goods and services and that they were capable of achieving a greater impact in their communities. However, the study noted that their contribution to rural development was not fully realized or exploited:

...their potential has in the last few years been eroded by confused policy, unclear roles of those involved, low morale among staff, and lack of adaptability. Non Governmental Organizations (NGOs) past assistance to youth polytechnics though extensive it has been marred by lack of co-ordination amongst them, resulting in duplication and neglect of certain needy areas (RoK, 1997, P. 102).

The study recommended that the government should take the lead in providing a revived sense of purpose and direction and that NGOs should not only co-ordinate their assistance but work more closely with government. The study by Action Aid laid main emphasis on co-ordination of the activities in the youth polytechnics in order to fully realize the contribution of youth polytechnics in rural development. The current study did not focus on coordination of activities at the Institutes of Technology level but instead, the researcher intended to establish the extent to which the Institutes of Technology have fulfilled their mandate of producing technically skilled human resource with the skills

fulfilled their mandate of producing technically skilled human resource with the skills required in the labour market for industrial development.

One major objective of TVET institutions is to provide industry /job specific training and the possibility for a better match between skills acquired in TVET and the skills required in the labour market. According to Johanson (2004), close linkage with the labour market is the single most important economic requirement for a training institution. He further argues that economic relevance calls for need to adjust outputs in an attempt to meet the market demands both quantitatively and qualitatively, depending on the changes in the labour market needs. The market demand changes over time must be detected and factored in adjustment in the training of students. The above arguments make it necessary for the researcher to question how often the Institutes of Technology adjust their training programmes to meet the needs of the labour market. Are the skills taught there, demand-driven? How often has the Kenya Institute of Education (KIE) changed the curriculum to reflect needs of industry?

Kerre (1995), in a detailed study on expanding capacity and improving Programme Quality in selected 'Harambee' Institutes of Technology (IT) and National Polytechnics, found out that the training institutions still operated far apart from the world of work. The study noted that there were no strong linkages between training institutions and industry. Kerre (1995) states that is the reason why there was a mismatch between skills acquired at the IT and skills that were required in industry. This study complements Kerre's study but since his study was done more than two decade ago, it made it necessary to find out if the scenario is the same today. Kerre's study is also on institutes of technology and the national polytechnics while the current study focused on whether

Orodho (1984) conducted a study on the role of village polytechnics (currently the youth polytechnics) in social-economic development of rural areas of Western Kenya. The study revealed that Maseno youth polytechnic had fulfilled its goal of training young people to acquire relevant occupational business skills that enabled them to earn a living. These graduates had also impacted positively on their community as they provided the required services. Orodho's study focused on Youth Polytechnics (YPs) in social-economic development of rural areas whereas this study focused on whether the Institutes of Technology have achieved their goal of producing graduates with relevant skills required in the urban (Nairobi) labour markets that can lead to industrialization.

A study by Kemunto (1996) on vocational education in the 8-4-4 secondary school curriculum and its relevance to the job performance of the school leavers in the urban agro-based industries found out that there was a mismatch of job placement in industrial labour market and that the basic knowledge and occupational skills of those who get employed in related fields were not adequate. Kemunto's study is complemented by the current study since it was about secondary school curriculum and its relevance to the job performance of the school leavers in agro-based industries. However, since skills training in schools are general, there is need to focus on the IT which are a higher level in terms of specialized skills training and find out if they produce graduates with relevant skills required in the labour market. In order to achieve industrialization by the year 2030, there is an urgent need for the nation to put in place the human capital with relevant knowledge and skills that would lead to the realization of such a goal.

Njihia (2005) did a study on income generating activities and their contribution to the provision of teaching-learning resources in national polytechnics in Kenya. In his study,

Njihia found out that the national polytechnics had set up income generating projects to assist them get extra finance but they still lacked adequate physical facilities and modern equipment since remuneration of the tutors took the lion's share of the extra income generated especially from the part time academic programmes. Lack of modern facilities and equipment has impacted negatively on curriculum delivery. While Njihia's study focused on the income generating activities adopted by the national polytechnics and their contribution to the provision of teaching/learning, resources, the current study sought to investigate the relevance of skills acquired at the Institutes of Technology to the skills required in the labour market.

A Study by Orodho and Nishimura (1999) on education, vocational and technical training and employment revealed that technical institutions generally lacked modern training equipment and facilities. Consequently, lack of modern training equipment implied that trainees were ill prepared for the job market where efficiency in production demands the use of most modern state of the art technology. This lack of modern equipment and facilities indicates a mismatch between training and needs of industry. This has serious economic consequences in that the graduates of these institutions have to be retrained when they join the industries. This has the effect of making training long and expensive for the country while production remains low.

Since Orodho and Nishimura's study was done almost a decade ago, the current study investigated if the Institutes of Technology have modern and up to date facilities and equipment that are essential to the production of graduates with relevant skills required in industry besides examining the existence of institution-industry linkages, challenges and policy implications.

For the country to achieve new industrialized country (NIC) status by 2030, emphasis ought to be put on the development of human capital with quality skills through the use of modern and up-to-date facilities and equipment. The academic members of staff also be adequately trained and frequently in-serviced through seminars, workshops and industrial exposure. This is necessary because as Kaime (1990) notes, a teacher is one of the most important factor in the implementation of school curriculum. Teacher effectiveness in curriculum implementation also highly depends on the teacher's motivation, and on the material resources available. The researcher investigated if the Institutes of Technology lecturers were relevantly trained, and motivated, and whether they had sufficient industrial exposure.

A study by Singh et al. (1985) on the relevance and effectiveness of in- school and on- the- job education/training programme found out that in-school learning/training was significantly relevant to the graduates' need for theoretical knowledge and job-related matters. But on the other hand, although in-school education/training was found to be generally effective, significant deficiencies were noted. First, employers and educationist agreed that in school training tended to be too theoretical at the expense of the practical component. Secondly, it was noted that in-school education/training focuses excessively on technology at the expense of personal development and administrative skills. It trains students for specific jobs instead of providing general education so that the students can develop broader perspective of the technical sciences in order to enter different fields. Finally, it was noted that in-school training was too isolated from the aggregate needs of the industry.

The study by Singh et al. (1985) is a comparative study on the relevance and effectiveness of in-school and on-the-job education/training to the needs of industry while the current study is on the relevance of skills training at the Institutes of Technology to the needs of industry. Singh's study used a survey design while the current study employed a descriptive case study design.

### 1.2 Research Design

This study employed a case study design, which was implemented as a quasi-experiment with the following research questions. The study is a case study of the only IIT in the state of Karnataka. Case studies are used to gather comprehensive, systematic, and in-depth information related to a single bounded case of analysis (Patton, 1990; Dolen (1993 p. 11)). Dolen (1993) defines a case study as "an intensive, in-depth study of one person, group, project, institution, or activity". Dolen is supported by Patton (1990 p. 241) who points out that "case study is a research procedure, involving the study of a particular case or cases with a view to providing a detailed description of the case or cases and to drawing conclusions about the case or cases". Dolen (1993) also states that "case study is a research procedure that involves the study of a single case or a small number of cases in order to provide a detailed description of the case or cases and to draw conclusions about the case or cases".

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Introduction**

In this chapter, the research methodology is discussed under the following sub-topics: research design, location of the study, target population, sample, sample size and sampling procedure, research instruments, validity and reliability of instruments, data collection and data analysis procedures and ethical considerations.

#### **3.2 Research Design**

This study employed a case study design, which was implemented, to a great extent within the qualitative research paradigm. The study is a case study of the only four IT that offer engineering courses. Case studies are used to gather comprehensive, systematic, and in-depth information related to a single, bounded unit of analysis (Patton, 1990). Dulen (1962 p. 220) defines a case study as “an intensive investigation of one person, group, project, institution or agency”. Dulen is supported by Patton (1990 p. 384) who points out that “cases can be individuals, programmes, institutions or groups”. A case study could use single or multiple real-life cases (Stake 1995). When using multiple cases, each case is treated as a single case and its conclusions can then be used as information contributing to the whole study (Patton, 1990). The case study was suitable in establishing a broad in-depth understanding of the relevance of education and training acquired at the Institutes of Technology to the needs of the labour market.

The major unit of analysis was the training institutions. The study employed multiple cases represented by the four IT. Each IT represented some unique characteristics based on the

endowment of the training institution, number of lecturers, physical facilities and equipment and distribution of graduates traced in industry. However, the four IT offered the three engineering programmes (Mechanical and Automotive Engineering, Electric and Electronics and, Building and Civil Engineering) that were the focus of this study. This study took interest in the engineering courses because engineers are critical for nations' economies, and for design, development and maintenance of infrastructure and technology and to sustainably satisfy communities.'

This study benefited a lot from the qualitative research paradigm because it is exhaustive. It allows the researcher to gather comprehensive, systematic, and in depth information about each case of interest (Patton, 1990). The qualitative researcher examines the entity being studied in-depth using a variety of data collection methods to produce evidence that leads to understanding of the case by answering specific research questions (Patton, 1990). According to Patton (1990), the strength of qualitative research is its use of multi-method data collection strategies. Personal experience, interview, life story, and visual texts were major sources of primary data for this study. The qualitative research methodology was appropriate for this study because it was designed to gather facts, knowledge, experiences, opinions, and judgement from the various respondents as concerns the relevance of education and training acquired at the IT to the needs of the labour market. Equally, the quantitative paradigm was useful in the sense that it enabled the researcher to collect data from many respondents whom she could not otherwise get to interview due to the nature of their work and time constraints.

### **3.3 Location of the Study**

The study was carried out in the then Nyanza and Central and Nairobi provinces. Currently, Nyanza and Central provinces have been subdivided in several counties.

Nyanza and Central provinces were selected because they were home to four IT that offered engineering courses. In Nyanza Province, two IT (Gusii IT and Moi IT) were visited. MOI IT was in Migori district while Gusii was in Kisii Central District. In Central Province, one institute (Kirinyaga IT) was in Kirinyaga while the other one (Muranga IT) was in Muranga District. Three of the IT were urban while only one (Moi IT) in Migori District was rural. On the other hand, the City of Nairobi was selected because many graduates from the four institutes of technology were found to be working there.

Nyanza Province was located in the southwest part of Kenya around Lake Victoria. The province had a population of 4,392,196 (as of 2009) within an area of 16,162 km<sup>2</sup>. Initially, Nyanza province had four administrative districts. Since the 1990s, the province has further been sub divided into the following districts: Bondo, Gucha, Homa Bay, Kisii, Kisumu, Kuria, Migori, Nyamira, Nyando, Rachuonyo, Siaya, and Suba.

[http://en.wikipedia.org/wiki/Nyanza\\_Province\\_\(Kenya\)](http://en.wikipedia.org/wiki/Nyanza_Province_(Kenya))

Kenya's Central Province covered the area around southwest of Mt. Kenya. According to the 2009 census, the province had a total population of 3,724,159 inhabitants for an area of 13,191 km<sup>2</sup>. The climate of Central Province is generally cooler than that of the rest of Kenya due to the region's relatively higher altitude. Rainfall is fairly reliable, falling in two seasons one from early March to May and a second during October and November.

Central Province is a key producer of coffee, one of Kenya's key exports. Much of Kenya's dairy industry is also based in this province. In reference to the 1999 census, Central Province was divided into seven districts. These are Nyandarua, Nyeri,

Kirinyaga, Maragua, Murang'a, Thika, and Kiambu.

[http://en.wikipedia.org/wiki/Central\\_Province\\_\(Kenya\)](http://en.wikipedia.org/wiki/Central_Province_(Kenya))

Nairobi Province had eight constituencies: Starehe, Westlands, Embakasi, Langata, , Makandara, Dagoretti, Kasarani and Kamukunji. At 1,795 metres (5,889 ft) above sea level, Nairobi enjoys a moderate climate. The altitude makes for some cool evenings, especially in the June/July season when the temperature can drop to 10 °C (50 °F). The sunniest and warmest part of the year is from December to March, when temperatures average the mid-twenties during the day. The mean maximum temperature for this period is 24 °C (75 °F). Nairobi is the most populous city in East Africa, with a current estimated population of about 3 million. According to the 2009 Census, in the administrative area of Nairobi, 3,138,295 inhabitants lived within 696 km<sup>2</sup> (269 sq m).

[http://en.wikipedia.org/wiki/Nairobi\\_Province\\_\(Kenya\)](http://en.wikipedia.org/wiki/Nairobi_Province_(Kenya))

### **3.4 Target Population**

The study targeted 15 IT spread across the country, 129 lecturers, 4 lecturers in – charge of industrial attachment, 22 Companies, 22 supervisors (who represented employers) and 270 IT graduates working in industries in the city of Nairobi, and the Senior Assistant Director in-charge of curriculum at Kenya Institute of Education (KIE). The IT were Ramogi, Moi, Gusii, Kimathi, Siaya, Mathenge, Kiambu, Kaimosi, Muranga, Coast, Sangalo, Kirinyaga, Rift Valley, Rwika and Meru College of Technology. However, at the time of the study, there were 12 IT nationally after three of them namely: Kimathi, Kiambu and Meru College of Technology had been upgraded to University College status.

officer in-charge of curriculum at KIE. The researcher targeted graduates with at least 2 years' work experience. It was assumed that a two year working experience could enable the graduates to compare/comment on knowledge and skills acquired at the Institutes of Technology as well as knowledge and skills required in the world of work.

### **3.5.2 Sampling Technique**

Purposive sampling was used to select four IT from the 12 available nationally. The four (Moi, Gusii, Kirinyaga and Muranga) were purposively selected because they were the only ones offering engineering courses that were of interest to this study. These engineering courses were: Building and Civil Engineering, Electrical and Electronics, and Mechanical and Automotive. On the other hand, the city of Nairobi was considered a suitable location for this study because it is the country's main industrial city. The city of Nairobi has various types of industries that are the major consumers of the graduates from TVET. These industries are: manufacturing industries, equipment and service industries. The selection of the industries was based on the presence of the graduates from the four institutes of Technology (Moi, Gusii, Kirinyaga and Muranga). According to Peil (1995) in purposive sampling, a subject or element is selected because it is considered either typical or outstanding example of the variables with which the research is concerned.

Gay (1992) points out that for small populations, a sample size of at least 20% of the population is a good representation while for large populations a sample size of 10% is representative enough. This study, therefore, used 25.8% of the lecturers' population which is equal to 24 lecturers. Purposive sampling was used to pick 12 Heads of Department (HoDs), (each from the departments of Electrical and Electronics, Building

and, Mechanical and Automotive engineering in each of the four IT). On the other hand, simple random sampling was used to select 12 lecturers (one from each of the above mentioned departments from the four Institutes of Technology). In simple random sampling, subjects are selected by chance hence giving each one of them an equal opportunity to be selected (Orodho, 2004).

Snowball technique was employed to trace 130 graduates working in 15 companies in the city of Nairobi. According to Kombo & Tromp (2006) snowball or chain sampling begins by asking people who know a lot about what is being investigated. Kombo and Tromp further observe that snowball technique is ideal in situations where the population is unknown or not readily identifiable.

In this study, information on the number of engineering graduates working in various industries was not available from the IT. This was because there was no system in place to find out where the students got employment. However, the IT gave names of companies in the city of Nairobi and other parts of the country that were generally perceived to absorb their graduates. This information and by asking other people (especially the graduates traced) assisted the researcher in tracing 130 IT graduates working in 15 companies. In this case, 15 immediate supervisors of the graduates automatically became part of the study sample. Further, a smaller sample of 10 graduates was purposefully selected for interviews. The selection of the 10 graduates was based on their willingness to create time to participate in the interview after work since it was not possible to interview any of them during working hours or lunch break due to time constraints on part of the respondents.

When a population is very small, one may study the whole population (Kombo & Tromp (2006; Orodho, 2004). Consequently, four lecturers in-charge of industrial attachment (one from each IT); the Senior Assistant director- in charge of Technical Education Programmes (TEP) at the Kenya Institute of Education (KIE) and 15 immediate supervisors formed part of the study sample. One lecturer in-charge of industrial attachment was not available for interview.

### **3.6 Research Instruments**

The researcher utilised mixed tools of data collection that included a questionnaire, semi-structured interviews, observation and document analysis. The use of the various tools of data collection allowed for triangulation for validation of information and helped to provide comprehensive in-depth information about the respondents' experiences and perceptions of the graduates working in industries. Marshall and Rossman (1995) and Mason (1998) argue that triangulation of data by use of multi-method approach is essential to answer many important questions involving complex processes that engage a number of actors.

#### **3.6.1 Questionnaire**

The questionnaires administered to the graduates from the Institutes of Technology consisted of both closed – ended questions and open - ended. The questionnaire was divided into sections (A and B). Section A of the graduates' questionnaire items sought to obtain background information of the respondents. Section B of the graduates' questionnaires elicited data regarding knowledge and skills demanded by the industry and the relevance of knowledge and skills acquired during the training at the Institutes of Technology to the needs of the labour market. In particular, they rated the level at which particular generic skills were required in the job performance and the extent to which

technical education and training had equipped them with such generic competencies. Questionnaires were therefore administered to all the eligible graduates as were available from a given company (*Ref. Appendix 3*).

### **3.6.2 Interview Schedule**

Interviews were conducted with heads of department, lecturers, the person in-charge of technical curriculum at Kenya Institutes of Education (KIE), and employers using a semi-structured/open-ended face-to-face interview schedules that provided in – depth data. Kane (1995) points out that semi-structured interview allow conversations and follow the social rules appropriate to the people being interviewed. According to Satyanarayana (1983), an interview is an important strategy for data collection because it allows the interviewer to cover all the dimensions of the investigation through probing of the participants. Kerlinger (1973) argues that more people are willing to communicate orally than in writing and hence provide data more readily in an interview. This method allowed the respondents to freely give their views and opinions on the various issues under discussion. The schedule contained a list of specific issues and questions that were explored.

The graduates' interview sought to probe further adequacy of education and training acquired at the Institutes of Technology to the needs of the labour market. In addition, the types of knowledge and skills that the graduates lacked were highlighted as well as the factors that contributed to inadequate acquisition of theoretical knowledge and skills required in the labour market (*Ref. Appendix 4*).

The heads of department and the lecturers' interview specifically sought information regarding their professional qualifications, facilities in the institutions, industrial

exposure, and specific skills taught to the learners, as well as the constraints they faced in their efforts to equip the trainees with the knowledge and skills required in the job market (*Ref. Appendix 5*).

The interview with the Senior Assistant Director in-charge of technical institutions curriculum interrogated the capacity of KIE to develop curriculum for the technical training institutions, and the process involved in designing technical education curriculum (TEP). The officer was interrogated about the strengths and weaknesses of TEP curriculum. He was also asked to make recommendations on how TEP curriculum can be made responsive to the needs of the labour market (*Ref. Appendix 6*).

With regard to the lecturers in charge of industrial attachment, the interview sought information regarding the processes used in attaching students to industry and the importance of industrial attachment as an aspect of education and training. They were asked if there existed strong linkages between the institutions and industry (*Ref. Appendix 7*).

The interviews with the supervisors sought to find out from the supervisors' assessment of graduates, the extent to which the graduates from IT were equipped with the knowledge and skills required in the labour market. Further, the interviews sought to gather information on whether the employers are involved in curriculum development and review. Equally, the supervisors were asked to give their recommendations on how technical education and training could be made relevant to the labour market requirements (*Ref. Appendix 8*).

technical education and training could be made relevant to the labour market requirements (*Ref. Appendix 8*).

### **3.6.3 Document Analysis Guide**

According to Peil (1995), documentary analysis relies on documents as sources of data. Documentary sources may range from international documents such as the World Bank and NGO reports, national documents such as government reports, educational curriculum material such as syllabuses, narrowing down to institutional records such as college enrolments and teacher establishment. Documentary sources were used as a critical tool in this study because they allowed for review of government documents such as Education reports and Economic Surveys. The education reports were analysed to find out Kenya's policies on education and training in relation to economic development. On the other hand, Economic Surveys were analysed to ascertain the government's expenditure on TVET. In addition, syllabuses for engineering courses were analysed to identify their relevance to the needs of the labour market (*Ref. Appendix 10*).

### **3.6.4 Observation Guide**

According to Kombo & Tromp (2006), observation attempts to derive data directly rather than relying on the report of the subject, as is done in the case of interview. Kathuri and Pals (1993), note that observations are much better in overcoming the weakness of self-reported evidence, which is subject to omissions and distortions. In this study, the researcher enlisted the service of a research assistant who had a background in engineering courses to assist in assessing and describing the state of facilities and equipment at the institutes of technology under study. As such, a direct structured observation guide was used to record physical facilities and the key equipments in each

facilities and equipment (*Ref. Appendix 9*).

### **3.7 Piloting**

Piloting is a useful strategy in ensuring reliability of research instruments. Wiersman (1985) observes that piloting is important as it helps identify misunderstandings, ambiguities and useless or inadequate items. For the purposes of this study the various research instruments were administered to different categories of respondents at Rwika IT and one industry (outside the main sample) to test the extent to which they were going to be understood and bring out the expected responses during the actual study. The pilot study helped the researcher to modify some questions thus enhancing reliability of the instruments. It also provided an opportunity for training research assistants on how to apply the research tools and assist the researcher effectively.

### **3.8 Validity and Reliability**

In qualitative research, concepts of validity and reliability are rather complex. However, ensuring validity and reliability of data collected is vital.

#### **3.8.1 Validity**

Validity refers to the extent to which an instrument explains or measures what the researcher would like to measure or explain. There are three types of validity that can be used to test validity of the instruments in education and social sciences. These are: criterion, construct and content validity. Orodho (2004) points out criterion related – validity refers to the use of a measure in assessing subjects' behaviour in a given specific situation while construct validity is the degree to which the data obtained from a given instrument meaningfully and accurately represents a given theoretical concept. On the

validity refers to the use of a measure in assessing subjects' behaviour in a given specific situation while construct validity is the degree to which the data obtained from a given instrument meaningfully and accurately represents a given theoretical concept. On the other hand, content validity is the degree to which a test measures the intended content area (Gay, 1992).

Bless, Higson-Smith, and Kagee (2006) explain that in order to properly measure the complex topics presented by social science, the researcher must ensure that data is presented on all the different components. According to Fraenkel & Warren (2002), content validity can be achieved through expert judgement in regard to what the content of the tests measure. In this study content validity approach was found applicable. Content validity was determined by systematically conducting a series of actions such as defining in precise terms specific content to elicit data required to answer specific research questions. To augment content validity, expert opinion was sought from the research supervisors and other scholars in the School of Education at Kenyatta University. These experts evaluated the content of the research instruments and ascertained that the content was valid. The instruments covered the full content of all the variables and research questions being answered. In addition, triangulation helped to confirm the validity of the process (Tellis, 1997).

### **3.8.2 Reliability**

According to Gay (1992), a research instrument is reliable to the extent it measures whatever it is measuring consistently while Begi (2007) points out that reliable instruments are steady in whatever they measure and yield comparable scores upon repeated administration. Wiersman (1995) points out that ensuring reliability in

variety of data collection techniques and collects adequate data. By using a variety of data collection procedures which included, questionnaires, interview guides, and observation guide, the researcher gathered comprehensive data that enabled her to explore the issues under investigation.

The test-retest technique was used to test reliability of the questionnaire. The researcher gave ten graduates a questionnaire to fill, then after two weeks, she re-administered a similar instrument and then a correlation coefficient for the two scores was calculated. A correlation coefficient was calculated using Pearson's r, which gave a correlation coefficient of 0.84. Gay (1992) observes that a correlation coefficient of 0.7 and above can be regarded as a high reliability.

$$r = \frac{\sum xy - \frac{(\sum x)(\sum y)}{N}}{\sqrt{\left[ \sum x^2 - \frac{(\sum x)^2}{N} \right] \left[ \sum y^2 - \frac{(\sum y)^2}{N} \right]}}$$

Where x = first test, y = second test, N = Number of respondents in both test x and y, (Archambault, 2000).

### 3.9 Data Collection Procedures

The researcher, with the help of two research assistants, was responsible for data collection. Appointments were organised with all the institutions that participated in the study. The research team began data collection from the institutes of technology and concluded with the industries. At the IT, the research team spent three days in each college conducting interviews with heads of department, lecturers and liaison officers in charge of industrial attachment following a programme given by respective respondents. The principal researcher conducted the interviews while the research assistants recorded the answers both electronically and manually.

Rhoades (1995) argues that researchers forget 50% of the details of an interview within 24 hours, and more than 75% by the end of the second day. It is from this background that, recording of the interviews was observed strictly during fieldwork. An observation guide was used to record key facilities and equipment and comment on their state after the interviews. In addition, 15 more data collection days were spent interviewing employers. It took two months to administer questionnaires to the 130 graduates employed in various industries. The whole data collection process took approximately four months of continued fieldwork.

### **3.10 Methods of Data Analysis**

The data gathered in this study was mostly qualitative although there was some quantitative data. Qualitative data analysis was an ongoing process, accompanying the collection of data throughout the study. This allows analysis to guide data collection and also enables the researcher to control the processes of data collection. Miles and Huberman (1994), point out that qualitative data analysis is complex and does not always form a distinct stage in the research process. Chege (2001) emphasises the value of ongoing analysis, arguing that the procedure enhances efficiency and flexibility in pursuing emergent and relevant information in the process of research, adjusting and modifying research instruments and the style of approach to fieldwork.

The researcher used the Statistical Package for Social Science (SPSS) to organize the quantitative raw data collected from questionnaires. The analysis of data was guided by the objectives of the study. Reference was made to the relevance of Technical Education Programme (TEP) curriculum to the needs of the labour markets; relevance of education and training acquired at IT to the needs of the labour market; challenges experienced by

the IT in their effort to equip graduates with relevant skills; and recommendations on strategies that can be employed to ensure that technical training at IT is relevant to the needs of the labour market.

The audio-recorded interviews were transcribed to generate transcripts. The transcribed data were then coded manually under the various themes already identified. Sorting and shifting through data was done to identify differences and similarities between themes. Data analysis was done to establish commonalities and differences to elaborate findings and discuss themes based on the existing body of knowledge. Key/striking quotations or insights were highlighted for reporting using direct speech. The outcome of the analysis was presented descriptively and in thematic structure in Chapter Four of this thesis. Conclusions and recommendations for further research are made on chapter five based on the findings.

### **3.11 Logistical and Ethical Considerations**

Before the researcher embarked on actual fieldwork, a research permit was obtained from the National Council for Science and Technology to carry out the research. Further clearance was sought from the Provincial Directors of Education in the then Central and Nyanza provinces to enable the research team to access the public institutes of technology within the provinces. Further, permission was sought from the institutes of technology, from the graduates working in industries and from a number of manufacturing, service, production and construction industries in the city of Nairobi.

During the actual data collection, the researcher explained to the respondents the purpose and objectives of the study and requested them to voluntarily participate in the study. This meant that no respondent would be forced to participate in the study. For the sake of

confidentiality, the respondents were assured that the information that they were to give would strictly be confidential and only meant for research purposes and that no reference whatsoever would be made to individuals, institutes of technology or companies during the reporting.

## CHAPTER FOUR

### DATA PRESENTATION, ANALYSIS AND DISCUSSION

#### 4.1 Introduction

In this chapter, data is presented, analyzed and discussed based on the findings from the study. To ensure confidentiality of the respondents and the training institutions visited for the study, real names are not used instead pseudonyms are used. The data is presented in themes, based on the three research questions. This study sought to answer the following research questions concerning the relevance of skills acquired by the engineering graduates from the IT to the needs of the labour market:

- (i) How relevant is the Technical Education Programme (TEP) engineering curriculum to the needs of the labour market?
- (ii) How relevant is the knowledge and skills acquired by engineering Institutes of Technology graduates to the needs of the labour market?
- (iii) What challenges are encountered by the Institutes of Technology in their efforts to prepare engineering trainees for the labour market?

The first section presents general information of the informants involved in the study. The second section deals with the relevance of Technical Education Programme (TEP) engineering curriculum to the needs of the labour market. The main focus of this section was the planned TEP curriculum generally and engineering courses in particular. Curriculum development and review processes were interrogated from the perspective of KIE, employers/supervisors and lecturers. In addition, two syllabuses of engineering courses (Certificate in Carpentry and Joinery) and Diploma in Mechanical Engineering {Fabrication Technology and Metallurgy}) were analyzed. The third section sought to

examine the relevance of education and training acquired by engineering graduates to the needs of the labour market. It is organized into six sub-sections that address theoretical knowledge and technical skills required in the labour market and adequacy of education and training acquired by IT engineering graduates to the needs of the labour market.

The fourth section focuses on the third research question which sought to identify challenges faced by IT in their efforts to prepare engineering trainees for the labour market. It is organised into financial constraints, capacities and preparedness of lecturers to implement TEP curriculum, industrial attachment, ICT and trainees characteristics.

## **4.2 Background Information**

### **4.2.1 Information about Institutes of Technology Graduates**

The researcher managed to trace 130 graduates working in various industrial sectors in Nairobi City. Out of the 130 graduates traced, 127 of them were male while only 3 were female. This was not surprising given that the enrolment of trainees in engineering courses is highly skewed in favour of men. For instance, enrolment statistics in the four IT revealed that out of 651 students enrolled in engineering courses only 26 (4%) were female while 625 (96%) were male. This information supports literature on gender and technical education that shows that there are few women in engineering courses (UNESCO, 1999; Ogol, 2000).

In addition, this information appeared to be in line with the long held tradition that women were suitable for courses such as secretarial, catering, knitting and dressmaking instead of engineering courses (RoK, 1999; MOEST, 2003; Ngerechi, 2003 and Afeti 2008). The absence of women in engineering courses was recognised by the Government

of Kenya which, in 2000, started offering women scholarships to join TVET institutions and pursue engineering-related courses (MoEST, 2005).

In regard to graduates' professional qualifications, out of the 130 graduates traced, 55 (42%) were certificate holders while 75 (58%) were diploma holders. Given this scenario, the difference on their level of training had implications on the knowledge and skills acquired and on their productivity.

Further, out of the 130 graduates traced 76 (58%) of the graduates had trained in mechanical engineering, while 34 (26%) had trained in building and construction. On the other hand, 20 (15%) had specialised in electrical and electronics. In addition, the researcher found that the graduates were involved in a wide range of activities such as automotive repairs, electric installation & maintenance, panel beating, spray painting, plumbing, carpentry, masonry and automotive electronics.

Out of the 130 graduates traced, majority of the graduates 57 (44%) had trained at Murigo IT. On the other hand, a large percentage 34 (26%) had trained at Keriche. In addition, 23 (18%) had trained at Guthero while 16 (12%) had trained at Meto. This information implies that all the IT were represented in the study and that Nairobi had fair share of IT graduates working in industries within the city. On the other hand, this data implied that majority of the graduates traced came from Murigo IT followed by Keriche which are, coincidentally, closer to the city of Nairobi as compared to Guthero and Meto.

Given the background, the question was on whether the curriculum used to train such graduates was relevant to the labour market needs. A good curriculum that is responsive

to the needs of the country is very critical because relevant education and training depends on it. If the country is thinking of industrialising by the year 2030, then a relevant curriculum is very important. As a result, the first research question sought to find out the relevance of TEP engineering curriculum to the needs of the labour market.

### **4.3 How Relevant is the Technical Education Programme (TEP) Engineering Curriculum to the Needs of the Labour Market?**

Quality training, to a large extent, depends on the curriculum that is in place and the extent to which it is in sync with the present and future requirements of industry and the economy at large (Kaane, 2004). It is generally agreed that a good curriculum should be responsive to the needs of the learners and the country at large. To be relevant, an IT curriculum needs to be sensitive to local conditions, while at the same time responding to the needs of the labour market and the overall economic development of a country. According to Otunga and Nyandusi (2010), a relevant curriculum prepares learners for life in their specific local environments and beyond.

#### **4.3.1 The TEP Curriculum**

##### **4.3.1.1 The TEP Curriculum Review and Development Process**

Information on the curriculum development process was gathered through interviews with the Senior Assistant Director in-charge of TEP curriculum at the KIE, supervisors and lecturers. The researcher was informed by the Senior Assistant Director in-charge of TEP curriculum that KIE works very closely with other related agencies and organizations in the process of curriculum development and review. These agencies include the Kenya National Examinations Council (KNEC) which is responsible for national public examinations, the Kenya National Union of Teachers (KNUT) which

represents teachers at KIE, the Directorate of Quality Assurance and Standards which is responsible for curriculum supervision and quality control and the Teachers Service Commission (TSC) which handles teacher recruitment, promotion and placement.

The researcher was further informed that there are three panels that are in charge of curriculum development at KIE. These are subject panels, course panels and the academic committee. The subject panels which consists 22 members are in- charge of drafting the curriculum in any specialised area. In the case of TEP curriculum, subject panel membership composition includes: the chair person who is drawn from the Ministry of Education, one curriculum specialist (in the relevant area) from KIE, 2 representatives from TVET institutions in each Province, 2 representatives from centres of excellence institutions across the country and 2 people from relevant industries. Once the subject panel is through with drafting the curriculum, the curriculum is taken to the second stage for validation by the course panel. The course panel members include the KIE Deputy Director for TVET and principals and heads of department from TVET institutions. After the curriculum is validated, it is tabled to the academic committee that among them is the Permanent Secretary, Ministry of Education and Director KIE for approval.

Bearing in mind the foregoing official position on the composition of TEP curriculum review and development panels and the processes it is expected to undergo, the researcher sought to find out from the Senior Assistant Director TVET the extent to which this is the case in practice. In particular, the researcher was interested in getting the officer's views on the extent to which lecturers and employers of TEP graduates were involved in the process of curriculum development. The officer's explanation is captured in the dialogue below:

**Researcher:** To what extent would you say that the lecturers and employers are involved in the curriculum making process?

**Interviewee:** On the part of the lecturers, we try as much as possible to get a fair representation depending on the subject or content area. As for the relevant industry, this is a bit tricky because these people are very busy so they cannot afford to be here for a week or two and you know the process of curriculum making or review is not a one day event; it takes some time – usually not less than two weeks for a sector specific meeting on curriculum development to be through. So KIE only makes use of those who are available. Once the draft is ready, as a formality, the curriculum document is taken to them to give their feed back.

**Researcher:** How does this work?

**Interviewee:** Well, on paper KIE is supposed to give copies of the curriculum drafted to employers to give their input about the document. But in reality, frankly speaking, once we have come up with the document, there are no revisions based on consumer feedback and that is why I am calling it a formality or requirement that is not taken seriously.

From the above discussion, it is evident that the involvement of industry in the process of curriculum making is not really much if we go by what the interviewee explained. To quote him “these people {from the industry} are very busy” and so they cannot afford to take one or two weeks leave from their busy schedules to attend to a critical workshop on curriculum development or review. This finding seems to suggest that there was little input of the industry people in the IT curriculum. As a result, IT curriculum development process falls short of being a deliberative, consultative, and participatory exercise as advocated by Mutch, (2001).

Further, the researcher sought to find out from the 15 supervisors (representing employers) whether they had been involved in curriculum development or review. Out of the 15, only one respondent indicated that he had attended a two-day forum hosted by KIE in 1996 to discuss the link between the technical schools and industry; and what employers expected of the training institutions. However, according to the interviewee, nothing much came out of the seminar, “*We never heard anything from KIE after that*

*seminar*'''. The other supervisors were categorical that they had never been involved in matters concerning curriculum development or review.

Interviews with all the 12 lecturers, 12 heads of department and the 3 lecturers in - charge of industrial attachment proved that they had never been involved or consulted during the process of curriculum development. It seems, therefore, that the IT lecturers' role is reduced to mere implementation of curriculum. This is inappropriate since as Fullan (1991) notes, "the implementation of curriculum innovations is bound to be unsuccessful if lecturers who are the key implementers are not involved in the entire process of curriculum development".

Although Curriculum scholars such as Marieda (2007) Otunga & Nyandusi, (2010) have argued strongly that curriculum review and development must include a variety of players including those that are expected to benefit from the education and training to those to whom the curriculum is to be taught; this does not seem to be the case in curriculum review and development process at KIE. From views of the Senior Assistant Director TVET, lecturers and supervisors it is indicative that lecturers and employers of IT graduates are involved only to a limited extent in the process of IT curriculum development and review.

This finding concurs with Nyandusi's (2001) finding. In his study, Nyandusi found that employers were dissatisfied with the preparedness of school graduates for the world of work. Further, employers indicated they had not been involved in curriculum review and development, but expressed a strong willingness to participate in curriculum development.

Bearing in mind the extreme importance of relevantly trained human resource in the realization of Vision 2030, the researcher was interested in finding out when the current IT curriculum, which is available in the form of syllabuses, was introduced and how frequently it had been reviewed to make it demand-driven so as to cater for the ever changing labour market needs.

#### **4.3.1.2 Historical Perspectives on the IT TEP Curriculum in Kenya**

Information for this section was sought out from the lecturers and the Senior Assistant Director in-charge of IT curriculum at KIE. In an interview with the Senior Assistant Director in-charge of TVET Curriculum at KIE, he confirmed to the researcher that the current Technical Education Programme (TEP) syllabuses for certificate and diploma levels were developed in the late 1980s within the framework of 8.4.4 (8 years of primary education, 4 years of secondary and a minimum of 4 years of university education). In addition, copies of TEP syllabuses available in his office further confirmed that the TEP engineering syllabuses were developed in the 1980s and 1990s. This meant that the TEP engineering curriculum was out dated.

The researcher further sought to know from the Senior Assistant Director in-charge of TVET curriculum what he thought would be the impact of training students using an outdated curriculum. This officer pointed out that the graduates produced would lack knowledge and skills needed in the labour market. He explained:

The impact is that we end up with trained people who may not be quite relevant in the world of work because you see at the end – if you take for example the area of electrical engineering, okay you can see electronics is a very dynamic area so if you stay for long before you review the curriculum, by the time you take those trainees for industrial attachment, they will find new or modern equipment which they have never seen before because like the current syllabuses, the recommended equipment for teaching/learning are very ancient.

From the above excerpt, it is clear that the interviewee appreciates the need for regular reviews of IT curriculum in enhancing the relevance of the curriculum to the realities of the workplace. However, it was learnt from the Senior Assistant Director in-charge of TVET at KIE that the Kenya government is now very keen about the review of TEP curriculum and has provided some funding for the review. This resulted in the review of at least 33 out of the more than 50 TEP programme syllabuses in 2009 which took a modular approach. Unfortunately, those syllabuses are still awaiting approval from the Ministry of Higher Education Science and Technology and the Kenya National Examinations Council (KNEC). All the same, the Assistant Director was hopeful that by the year 2012, the new modular curriculum would be in place and the current curriculum will be phased out.

Interestingly, the Ministry of Education report (RoK, 2005) indicated that the TEP curriculum was outdated and concluded that the TEP curriculum was therefore not responsive to the needs of the labour market. However, as damning as this conclusion was, the review process did not start until 4 years later and the reviewed curriculum has yet to be implemented.

All the 15 lecturers interviewed were also of the opinion that the IT curriculum had not been changed for a long time and that it required urgent review so as to conform to the needs of the labour market. The views noted in the discourse above suggest that the current TEP curriculum for IT is obsolete and inflexible as it was developed in the 1980s and it has not been reviewed ever since. The implication is that the curriculum is not relevant to the current needs of the labour market due to technological changes, among other things.

Since the focus of the objective under discussion is the relevance of TEP curriculum to the needs of the labour market, the needs of the labour market were interrogated from the perspective of the employer (represented by the graduates' immediate supervisors) so as to draw a conclusion on whether or not the TEP curriculum is relevant.

#### 4.3.1.3 Supervisors' Views on the Needs of the Labour Market

Data on the needs of the labour market were gathered through interviews. The needs of the market as identified by the supervisors are presented in Table 4.1 which summarizes their views on the skills needed in Mechanical and Automotive Engineering, Electrical and Electronics Engineering and Building and Civil Engineering.

**Table 4.1 A Summary of the Labour Market Needs for Mechanical and Automotive Engineering, Electrical and Electronics Engineering and Building and Civil Engineering**

<b>Mechanical Engineering/Auto Repairs</b>	<b>Electrical &amp; Electronics Engineering</b>	<b>Building &amp; Construction Engineering</b>
Auto repairs	Electrical installation	Drawing architectural plans
Auto maintenance Servicing & overhaul	Electrical maintenance Repair & maintenance of electrical gadgets	Site survey Putting up a building (brick laying, roofing)
Air conditioning	Control of electrical machines	Woodwork
Auto electrics	Designing of circuits Electricity wiring	Drainage Preparing costs
Auto vehicle engineering	Design & test any given electrical instrument	Estimates of building
Auto transmission Machining & Fabrication Small engines Diesel engines Welding Computer diagnostic	Air conditioning	Renovations All construction works

Table 4.1 shows that with respect to Mechanical Engineering and Auto Repairs, some of the needs of the market included Auto Electrics; Auto Maintenance; Computer

Diagnostics on vehicles; transmission repairs and skills in dealing with small engines and diesel engines. On other hand, in Electrical and Electronics Engineering, some of the needs included wiring, repair and maintenance of electrical and electronic equipments, operation of electrical machines and construction of basic electronic circuits. In Building and Construction Engineering, some of the needs of the labour market included: Building services, maintenance and demolition, construction methods, roofing finishes and interior design.

After the supervisors identified the labour market needs, the researcher sought to know from them the types of knowledge, skills and personal attributes that were required of employees with qualifications in any of the three specialisations. Table 4.2 gives a summary of the employees attributes required in the labour market.

**Table 4.2 A Summary of Employees' Attributes Required by the Labour Market**

<b>Attributes</b>	<b>N=15</b>	
	<b>Count</b>	<b>Percent</b>
Practical skills	15	100
ICT skills	15	100
Problem solving skills	15	100
Ability to work alone with minimal supervision	13	87
Right attitude	12	80
Diagnostic skills	12	80
Good communication skills	11	73
Theoretical knowledge in the area of specialisation	10	67
Interpersonal skills	10	67
Innovative	9	60
Versatile	9	60
Management skills	8	53
Customer care skills	8	53

The supervisors were emphatic that they required graduates with right attitudes, thorough theoretical knowledge in their area of trade; adequate practical skills and hands – on- experience in the job. In addition, the supervisors pointed out that they needed employees who were well versed in Information Communications and Technology (ICT), innovative and were versatile with regard to skills.

Further, problem solving, diagnostic, management, interpersonal relations, customer care, and communication skills were among the other types of knowledge and/or skills that employers said were demanded in the labour market. On the other hand, ability to work in a team or to work individually and to take initiative as well as observe safety precautions in the work place were stressed.

Having identified the needs of the labour market, the researcher reviewed the content of TEP curriculum to ascertain if the needs of the labour market were catered for in the TEP curriculum. The next section focused on the structure of TEP engineering curriculum and an analysis of two engineering courses {certificate in Carpentry and Joinery and diploma in Mechanical Engineering (Fabrication Technology and Metallurgy)} to find out the extent to which the syllabuses addressed the needs of the labour market.

#### **4.3.1.4 The Structure of the Current TEP Programme**

The TEP curriculum which is centrally developed at the KIE comprises of syllabuses for the different specialisations offered at certificate and diploma levels. This study focused only on certificate and diploma Engineering courses. In analyzing the relevance of TEP curriculum to the needs of the labour market, the researcher focused on two syllabuses - the syllabus for certificate in Carpentry and Joinery and the syllabus for diploma in Mechanical Engineering (Fabrication Technology and Metallurgy). This was because

they were the only two syllabuses available at the KIE library. It is important to note that the TEP syllabuses were not at the KIE bookshop because they were no longer being reproduced. The analysis of the two syllabuses focused on: (i) National aims of Technical Training Programmes (ii) General objectives TEP programmes (iii) The structure of Certificate and Diploma Engineering courses, and (iv) Assessment.

#### **4.3.1.4.1 National Aims of Technical Training Programmes**

All TEP syllabuses begin with a statement of the national aims of technical training at both post-primary and post-secondary levels. The four national aims of technical training state that in Kenya, technical training should: (1) provide increased training opportunities for school leavers that will enable them to be self - supporting; (2) develop practical skills and attitudes which will lead to income earning activities in urban and rural areas through salaried employment or self-employment; (3) provide practical education and skills which are responsive and relevant to Kenya's agriculture, industrial, commercial and economic needs; and (4) provide people who can apply scientific knowledge for solutions of environmental problems, and to encourage self-employment while at the same time producing skilled artisans, technicians and technologists for both formal and informal sectors in the ratio of 1 technologist, 5 technicians and 30 artisans respectively (KIE, 1996).

These national aims of TEP are really ambitious. However, whether the syllabuses guided by those aims are relevant to needs of labour market is a different issue. From the above aims of technical training, aim number one is not at all related to the needs of the labour market, but rather it talks about providing more training opportunities for the increasing number of school leavers who miss out on opportunities to either join secondary school

or university after completion of primary school and secondary school levels respectively. However, there is an emphasis on the intention to provide graduates with practical skills and attitudes that will lead to either self or wage employment. At the same time according to objective number three, technical training is expected to provide the trainees with practical education and skills which are responsive and relevant to Kenya's industrial needs, among other sectors. The two aims suggest the intent of TEP engineering curriculum to be relevant to the needs of the labour market.

#### **4.3.1.4.2 General Objectives of Certificate Programmes**

The general objectives of craft training programme are to:

- i. Develop skills and attitudes to enable the trainee enter gainful employment;
- ii. Provide basic foundation to the trainee pursue advance courses on either full-time or part-time basis (KIE, 1986).

#### **4.3.1.4.3 General Objectives of Diploma programmes**

The general objectives of technician training programmes at the post-secondary level make reference to developing middle level technically skilled human resource with adequate relevant skills required in the country. The objectives of TEP curriculum are to:

- i. Develop skills which will be responsive and relevant to the country's human resource required at the middle level;
- ii. Prepare trainees so that they can enter the world of work with confidence in either salaried employment or self-employed;
- iii. Impart adequate skills which will enable the trainee to operate either as a craftsperson or perform middle supervisory functions (KIE, 1996).

All the objectives make reference to labour market requirements. Consequently, it seems that they are designed to ensure that graduates from technical training institutes have acquired adequate practical skills required in the labour markets for either wage or self employment. The objectives seemed to link training to the world of work but the implementation would determine whether or not the link is achieved.

#### **4.3.1.4.4 The Structure of Engineering Certificate and Diploma Courses**

The certificate courses were designed to take 2 years or 1,980 hours and it was organized in 2 stages with 990 hours going to each stage. In addition, the certificate course was designed to be 80% practical and 20% theory. On the other hand, at the diploma level courses were designed to have a duration of 3 years which were equivalent to 2,970 hours. They were organized in three stages each with 990 hours. The diploma course was designed to be 40% practical and 60% theory.

Time allocated to the certificate course put emphasis on practical skills while the time allocation for diploma courses suggested a fairly heavy emphasis on theoretical knowledge. The relatively heavy emphasis on theoretical knowledge might be indicative of an academic orientation in the TEP diploma curriculum. Whereas objective number two of the technical training TEP curriculum made reference to imparting adequate skills to trainees to enable the graduates to operate competently in their areas of specialisation, it was questionable if this was achievable given that 60% of their training was devoted to theory.

The researcher sought the lecturers' views on the structure of the courses through interviews. The lecturers indicated that the two years available for the TEP certificate

programme are grossly inadequate. Some lecturers pointed out that this same syllabus was originally designed to take three years. They pointed out that when the duration for the certificate course was reduced to two years, the only subject that was done away with was Kiswahili while English was replaced with communication skills. The implication here is that the available time for training technically skilled certificate level graduates at the IT is not sufficient to cover a syllabus that was designed to take three years but now takes two years. Further, the training institutions might not be having enough time to engage in the kind of learning activities that would lead to acquisition of adequate knowledge and practical skills required in the labour market.

Equally, the lecturers also acknowledged that the hours specified for theory and practicals for TEP curriculum were not being realised due to shortage of facilities such as workshops and equipment. In that case, this might suggest that diploma graduates leave the training institutions when they are not well grounded in practical skills required in the labour market.

The TEP curriculum has three components: content subjects (theory and practicals), project work and industrial attachment. In each area of specialisation, the trainees are exposed to a number of subjects that provide them with general theoretical knowledge (*This information is covered under specific courses in this section*). According to the syllabuses, teaching and learning should be carried out through various approaches including: classroom lecturing, laboratories and workshops practicals, visits/educational tours to industries, project work, and industrial attachment.

#### **4.3.1.4.5 Industrial Attachment**

Industrial attachment is intended to ensure that before the end of the course (at each level), each trainee has been attached to an organisation practicing the relevant trade where he/she is expected to familiarise with all or most aspects of his/her area of specialisation. For this reason, the TEP curriculum required that a trainee at the certificate level take three months (330 hours) or a sixth of the training period while at the diploma level industrial attachment was designed for six months (660 hours) which was also equivalent to a sixth of the three years training period. However, while trainees were involved in learning subject content and practical skills throughout their two years or three years of their certificate or diploma training respectively (except when they were on industrial attachment), industrial attachment took a total of only 3 months of the 2 years (24 months) or 3 years (36 months) of training period.

Time allocated to industrial attachment pointed to less emphasis being put on linking training to the labour market which was not in line with the best practices of TVET programmes in the world. For instance in Germany and Malaysia TVET training is based on dual training principle in which trainees alternate between attending theoretical classes in skills training institutions and receiving on-the-job training at the work place. As a result, TVET is very effective in these countries because by the end of the training period the trainees had acquired adequate theoretical knowledge and technical skills required in the labour market. This implies that the time allotted to industrial attachment in Kenya is inadequate. As a result, the trainees do not acquire adequate hands-on the-job experience.

#### **4.3.1.4.6 Assessment in the TEP Engineering Programme**

In the TEP programme, assessment of learning is done through Continuous Assessment Tests (CATs) and national examinations. The CATs are done internally while the national examinations are administered by the Kenya National Examinations Council (KNEC). The CATs and the national examinations are used as benchmarks for certification. Continuous Assessment Tests which comprise of practical work done by the trainee, account for 30% of the total marks. On the other hand, the external examinations are entirely paper and pencil tests with no practical aspects. These examinations which are purely theoretical are given a weighting of 70% in the determination of the end of the course results.

In addition, there is also project assessment. Project work refers to a piece of work by an individual trainee or by a group of trainees. It could be practical, evaluative, descriptive or research based project. A trainee is expected to carry out two projects. One of the projects related to the trade is supposed to be examined by the Kenya National Examinations Council (KNEC), while the other one is an entrepreneurship project that is also supposed to be submitted to KNEC for validation.

The fact that theory external examinations account for a whole 70% is a pointer to the emphasis given to acquisition of theoretical knowledge at the expense of practical orientation. The external TEP examinations by KNEC determine whether a trainee is awarded a certificate or not. As such, teaching in the IT tend to put more emphasis on theoretical knowledge that is tested by KNEC for the purposes of passing the examinations. This beats the logic of technical training being practical oriented since the emphasis here is mainly teaching for examinations.

Again, in a practical oriented course, one would have expected that it was mandatory for the project work to be practical based. But as things stood out, there was no emphasis on acquisition of practical skills through a practical project as the trainees had options to carry out theoretical projects and not necessarily practical ones. In addition, the curriculum was silent on the trainees' assessment during industrial attachment.

To get a more in-depth knowledge of the IT curriculum, the researcher sought to conduct a detailed analysis of two engineering syllabuses: (i) the certificate level Carpentry and Joinery syllabus, and (ii) diploma in Mechanical Engineering (Fabrication Technology and Metallurgy) option that were available at KIE.

#### **4.3.1.5 The Certificate Level Carpentry and Joinery TEP syllabus**

The content that was covered for Carpentry and Joinery course was found in TEP syllabus for 1986 (KIE, 1986). In the syllabus, the intentions of the course that were stated in the form of aims and general objectives provide an indication of whether or not the syllabus focused on the training-work link. The introductory part of TEP syllabus for Carpentry and Joinery course explained that a carpentry/joinery graduate is expected to carry out woodwork jobs on sites and be able to make joinery in a workshop efficiently. It was noted that the course was designed to develop these skills to make the trainee proficient in the wood working trade.

The programme is supplemented with related subjects expected to develop knowledge, skills and attitudes which in addition would enable the trainee to pursue further training.

The subjects covered in this course are Mathematics, Science, General Studies, Applied Geometry, Carpentry and Joinery.

#### **4.3.1.6 General Objectives of the Certificate Level Carpentry and Joinery TEP**

##### **Syllabus**

The TEP 1986 syllabus outlines five objectives to be achieved at the end of the course. These are: (i) develop skills in proper, safe and care for woodworking tools and equipment (ii) acquire practical skills and attitudes that will lead to income earning activities in the urban or rural areas (iii) develop safety awareness required in the wood working shops and sites (iv) acquaint the trainee with basic scientific knowledge for solving simple problems related to the trade (v) acquaint the trainee with the range of occupational and training opportunities in the industry.

Two of the five general objectives (ii) and (iv) of Carpentry and Joinery make reference to acquisition of practical and problem solving skills. The rest of the objectives focus on generic technical skills related to proper use and care of tools and equipment; and safety awareness in the work environment which are all relevant to the labour market needs. However, as noted earlier, the main emphasis of this programme was the acquisition of practical skills. Consequently, there was an overemphasis on acquisition of practical skills that was allocated 80% of the total contact hours spent at the IT while theoretical knowledge was allocated only 20% (*See Appendix 10*). Theoretical aspects were allocated a total of 158 hours during the two years (79 hours per year) while practical lessons were allocated 713 hours per year, giving a total of 1426 hours for the two years.

From the foregoing analysis of the certificate course in Carpentry and Joinery, the main point that emerged was that the programme had mainly focused on imparting practical skills and abilities that were not transferable to a wide range of occupations. The syllabus had focused specifically on specific technical skills that would quickly become obsolete instead of focusing more on processes and abilities of students to critically think and solve problems that are relevant to societal needs.

#### **4.3.1.7 The Diploma Level Mechanical Engineering (Fabrication Technology and Metallurgy) Syllabus**

The content covered in the TEP curriculum for Mechanical Engineering (Fabrication Technology and Metallurgy) is contained in the 1996 TEP syllabus (KIE, 1996). In the introduction segment of the syllabus, the aim of training is explained as an intention to prepare the trainees for future employment in the field of Mechanical Engineering. The course was intended to equip the graduates with technical and problem solving skills, diagnostic analytical abilities and general theoretical knowledge to enable the trainees contribute positively to the society. In addition, it aimed at also ensuring that the trainees were able to work safely, accurately and efficiently in any mechanical engineering site.

Twenty subject areas were covered in diploma in Mechanical Engineering (Fabrication Technology and Metallurgy) and the syllabus outlined specific objectives for each unit. Table 4.2 provides a summary of the content offered in the diploma in the Mechanical Engineering (Fabrication Technology and Metallurgy) course.

**Table 4.3 Diploma Mechanical Engineering (Fabrication Technology and Metallurgy) Course Content Summary and Time Allocation**

<b>Subject</b>	<b>Time allocation in hours</b>
Mathematics	187
Social Studies	66
Physical Science	110
Drawing	154
Communication Skills	110
Entrepreneurship Education	150
Computer Application	88
Management	66
Electrical Industrial Organisation	66
Electrical Engineering Science	66
Mechanical Engineering Science	66
Workshop Technology & Practice	66
Measurement	44
Welding & Fabrication	440
Pattern Development & Design	132
Mechanical Technology & Practice	198
Workshop Technology & Practice	66
Material Science & Metallurgy	132
Engineering Drawing	154
Project	22
<b>Total</b>	<b>2310</b>

*Source: KIE 1996 syllabus*

Although TEP curriculum was designed so that at the diploma level 60% of the 3 years training period was designated to theory and 40% to practical application, looking at Table 4.3 it is difficult to tell if the allotted time was achieved because time allocation for teaching is lumped together and has not been broken down further (into how much time would be spent on theory and practicals). It was therefore difficult to ascertain how much time was spent in theory or practical. This was because unlike in the case of Carpentry and Joinery where specific time was allocated for practical and theory lessons, in Mechanical Engineering (Fabrication Technology and Metallurgy) time allotted to theory and practicals was not broken down to specifically show the exact hours allocated to each

(theory and practical). As a result, it was not possible to know whether the time allocated for theory (60%) and practical (40%) was realized.

#### **4.3.1.8 General Objectives of the Diploma Level Mechanical Engineering (Fabrication Technology and Metallurgy) TEP Syllabus**

According TEP syllabus for diploma in Mechanical Engineering (Fabrication Technology and Metallurgy), at the end of the course, the trainees should be able to:

- i. Understand the working principles of fabrication and welding machines and equipment
- ii. Understand the physical and metallurgical properties of materials and their engineering application
- iii. Read and interpret work drawing
- iv. Apply knowledge and skills when developing patterns and designing components
- v. Fabricate components to the required standards
- vi. Apply knowledge and skills when organising and managing the production and maintenance of workshops
- vii. Demonstrate safety measures awareness when working in the workshop

The TEP Mechanical Engineering (Fabrication Technology and Metallurgy) syllabus seemed to focus on both theoretical knowledge and technical skills. This was evidenced in the general objectives of the course with objective one to three laying emphasis on theoretical knowledge required in Mechanical Engineering (Fabrication Technology and Metallurgy) option while objectives four to seven emphasise technical practical skills.

From the foregoing general analysis of the TEP curriculum and more detailed analysis of the certificate course in Carpentry and Joinery and the diploma in Mechanical Engineering (Fabrication Technology and Metallurgy), it appears that the syllabuses tried to link the curriculum and the labour market and especially with regard to emphasis on practical skills. This was evident from the national aims and general objectives of TEP which made reference to preparing trainees with skills responsive to the labour market needs. Whether or not these intentions of the syllabus were realised is addressed in the section on whether or not the graduates were appropriately prepared for the world of work later on in this thesis (*see section 4.4*)

#### **4.3.1.9 The Key Points that Emerged from the Foregoing Analysis of TEP Engineering Syllabuses are:**

- There was a link between TEP engineering curriculum and labour market. This was because for instance, some of the goals of TEP curriculum were intended to develop in the trainees' practical skills and attitudes which would lead to income earning activities in urban and rural areas through salaried employment or self-employment; and provide practical education and skills which are responsive and relevant to Kenya's industrial needs.
- At the certificate and diploma levels, the objectives emphasized aspects of safety precautions, care of tools, practical skills and acquisition of good attitudes to work which according to the employers were critical in the employees' job performance. In addition, the diploma course was intended to equip the graduates with technical and problem solving skills, diagnostic analytical abilities and general theoretical knowledge to enable the trainees contribute positively to the society which is relevant to the labour market requirements.

- However, the objectives of TEP engineering curriculum failed to address other non technical skills needed in the labour market such a communication skills, customer care, and management skills. This means that the graduates produced lacked the non technical nature skills like interpersonal, team building, and customer care knowledge that were relevant to the needs of the labour market. Moreover, the curriculum had failed to lay great emphasise on critical types of knowledge such as Information Communications and Technology (ICT).
- There was an overemphasis on acquisition of practical technical skills at the certificate level on one hand, and over emphasis on acquisition of theoretical knowledge at the diploma level. This means that the curriculum was not designed to produce graduates who were adequately prepared in both theoretical knowledge and practical skills at all levels as was required in the labour market.
- The foregoing discourse suggests that theoretically, the aims of the TEP Curriculum for engineering courses were oriented to the needs of the labour market. Whereas the link is very strong in the aims and objectives, the link is not so strong in the subject areas so as to attain the intended aims or objectives of TEP programme. This means that there is a gap between the knowledge and skills required in the labour market and knowledge and skills imparted at the IT.

Although the analysis of the TEP curriculum has shown that the component of the programme courses at the IT were labour market oriented, whether the graduates of IT were adequately prepared with relevant knowledge and skills required in the labour market would depend on the actual curriculum implementation. This study did not delve into the actual curriculum implementation through classroom observations but rather

relied on the views of the graduates and supervisors on whether the graduates were adequately prepared with the knowledge and skills required in the labour market. The next research question was designed to investigate the relevance of the knowledge and skills acquired by engineering IT graduates to the needs of the labour market.

#### **4.4 How Relevant is the Knowledge and Skills Acquired by Engineering IT Graduates to the Needs of the Labour Market?**

After examining the relevance of IT curriculum to the needs of the labour market, the researcher sought information from the graduates and employers/supervisors on whether the graduates were adequately prepared for the labour market. An observation schedule was also used to elicit information about the adequacy and state of facilities, equipment and learning resources that were used to prepare graduates for the labour market.

##### **4.4.1 Theoretical Knowledge and Technical Skills Required in the Labour Market**

According to Singh et al. (1985), for a person to be successful in the industrial career that he/she is doing, one must possess the relevant theoretical knowledge and technical skills required in that field. These types of knowledge and skills are to a great extent acquired through formal TVET. As such, the effectiveness of such a programme can be best determined by first identifying the type of knowledge and skills needed on the job and then checking with individual graduates about the extent to which their education and training has equipped them with such knowledge and developed the skills.

A good and effective education and training system is expected to satisfactorily equip the trainees with the knowledge and skills demanded in the labour market. As a result, the researcher collected data on key players' perceptions on the extent to which IT programme offers relevant knowledge and skills using a tool that was developed by

Singh Natarajan, Sarin, Dey & Sanyal (1985). This tool had a pre-identified knowledge and skills necessary in an effective programme. The researcher asked the graduates (i) whether or not the types of theoretical knowledge and technical skills were required in their job (ii) the extent to which the IT programme had helped them to acquire them.

In a scale of 1-4, the extent to which various theoretical knowledge and technical skills was required on the job was rated as well as the extent at which education and training as provided in IT colleges helped the graduates acquire those skills. For purpose of easier understanding of this assessment, the numbers in the scale carries the following meaning:

- |                           |     |
|---------------------------|-----|
| a) To a low extent        | = 1 |
| b) To some extent         | = 2 |
| c) To great extent        | = 3 |
| d) To a very great extent | = 4 |

The results of this assessment is summarised in Table 4.4

**Table 4.4 Average Score of Items Showing the Extent to which Knowledge/Skills are Needed on the Job and the Extent of Help Received from Institutes of Technology**

ITEM	N=130				
	Total score of knowledge and skills needed	Mean score	Total score on help received	Mean score on help received	Gap
Theoretical knowledge about technical aspects of your job	356	2.7	338	2.6	0.1
Theoretical knowledge about administrative techniques	328	2.5	197	1.5	1.0
Theoretical knowledge about people and their motivation	352	2.7	247	1.9	0.8
Theoretical knowledge about building effective teams	340	2.6	234	1.8	0.8
Skills in handling technical problems	394	3.0	195	1.5	1.5
Skills in handling administrative problems	351	2.7	234	1.8	0.9
Skill in motivating people	380	2.9	208	1.6	1.3
Skills in handling building effective teams	378	2.9	236	1.8	1.1
Skills in innovative thinking (e.g developing new & applying new & better ways of doing your job)	390	3.0	273	2.1	0.9

Generally, data from Table 4.4 shows that on average all the generic skills were almost to a great extent needed in their job performance. This is because the average scores range from 2.5 to 3.0 where 2 stands for 'to some extent' while 3 stands for to 'a great extent'. However, if the average scores were rounded up to one whole number, it would translate to an average score of 3, meaning all generic competencies were required by the graduates to a great extent in the job performance.

On the other hand, data from Table 4.4 is very revealing particularly about the apparent gaps in IT efforts to prepare trainees adequately with the relevant knowledge and skills required in the labour market. This is shown in the mean scores that range from 1.5 to 1.9 except in theoretical knowledge about technical aspects of the job that stood at 2.6 and skills in innovative thinking at 2.1. A mean score of between 1.5 to 1.9 indicates the graduates' perceptions that IT prepared them, to a low extent, with skills required in the labour market. It means then that some trainees graduate without having acquired knowledge and skills required in the labour market. This also raises questions on the issues of quality control and the training of technically skilled trainees at the IT for the labour market.

What the data on graduates' perceptions mean is that the IT had only succeeded in preparing the graduates satisfactorily with the theoretical knowledge about the technical aspects of their job(s) since the mean score on the extent the IT helped the graduates acquire theoretical knowledge about technical aspects of the job is 2.6 while the extent at which the knowledge is required in job performance is 2.7. A difference of 0.1 is probably not big enough. This is because the most desirable mean would have been 2.7 to imply that the IT were able to equip the graduates with the theoretical knowledge about the technical aspects of their job(s) in equal measure as required in the labour market.

However, data from Table 4.4 illustrates a big difference or gap in all the other generic skills between the extent to which knowledge and skills are needed on the job and extent to which IT helped the graduates to acquire them. The biggest gap is noticed in the acquisition of skills in handling technical problems. Whereas on average this skill is required to a great extent in the job performance having a mean score of 3.0, the extent to

which education and training enabled the graduates to acquire the same stands at 1.5 which suggests that there is an education and training gap of 1.5. A difference of 1 and above is considered big and so other skills where there is a big gap between the extent the skill is required in the job performance and the extent IT helped the graduates acquire them include: the skill of motivating people (1.3), skill in building effective teams (1.1), and theoretical knowledge about administrative techniques (1.0).

As it can be noted in Table 4.4, according to the perceptions by the graduates, the IT can therefore be said to have failed, to a very great extent, in preparing the trainees with relevant knowledge and skills required in the labour market except in imparting theoretical knowledge about technical aspects of their job that got a mean score of 2.6 against the required 2.7.

To further probe on the relevance of knowledge and skills acquired at IT to the needs of the labour market, the researcher sought to find out from the graduates the extent to which they were adequately trained with the theoretical knowledge and skills needed in job performance in their areas of specialization. Secondly, in an open-ended question the graduates were asked to give reasons for their answer.

Out of the 130 graduates 99 (76.1%) stated that they were adequately prepared with the theoretical knowledge and skills needed in their job performance, while 31 (23.8%) said they were not. Table 4.5 shows the graduates' responses from a questionnaire.

**Table 4.5 Graduates' Responses on Whether or not they were Adequately Prepared for World of Work.**

N=130		
Responses	Frequency	Percent (%)
Yes	31	23.8
No	99	76.1
<b>Total</b>	<b>130</b>	<b>100</b>

The researcher probed reasons for responses through interviews. Of the graduates who said that they were adequately prepared, they supported their stand on the ground that they got employed and their employers were happy with their job performance. One respondent stated, *"I was well prepared because I have been able to meet the expectations of the people I serve"*. This argument exhibits a lot of confidence from the graduate concerning the training. In fact, even some employers, especially from building and civil engineering sectors, pointed out that IT graduates especially at the certificate level were really good in their practical work. The satisfaction could be attributed to the fact that at the craft level (80%) of learning time in the IT is allotted for the practicals while only 20% is relegated to theory as was revealed in the curriculum analysis.

In contrast, the respondents who stated that they were inadequately trained gave diverse reasons in support of their views. However, the graduates generally reported that facilities for doing practicals were inadequate and that more practical and on-the-job experiences were required. One of the graduates stated, *'theory was adequate but lack of facilities was a hindrance to the much needed practical experience'*. Another respondent said that the training was not practical as more emphasis was placed on theory at the expense of practice. She said, *'I had little of the skills required in the labour market because at the college, theory took most of the time.'* This argument has a bearing on the time allocated for theory which stands at 60% and 40% practical in diploma courses.

In addition, another respondent explained, *'Theoretically, I was well trained but not practically because the machines and other tools were inadequate and outdated when compared to what I found in the market'*. Yet, another respondent was blunt, *"Theoretical knowledge and skills acquired at the IT do not reflect the actual situation in the world of work"*.

Generally, the graduates explained that they were not adequately prepared because there was a shortage of physical facilities such as workshops and laboratories, outdated curriculum, insufficient industrial exposure, lack of learning materials, and shortage of lecturers. One of the graduates stated that the books they used in learning were outdated as they had been published in the 1940s.

Since the graduates felt that they were inadequately prepared, the researcher sought to highlight (other than those discussed above) the other types of knowledge and skills that they lacked. This information is illustrated in Table 4.6.

**Table 4.6 Graduates' Responses on the Skills they Lacked**

<b>Generic skills**</b>	<b>N=130</b>	<b>%</b>
ICT skills	123	94.6
Communication skills	91	70.0
Team building skills	83	63.8
Customer care skills	79	60.8
Administrative skills	77	59.2
Diagnostic skills	75	57.7
Management skills	70	53.8
Report writing skills	68	52.3

**(\*\*This was a multiple response question; 130 graduates could give more than one skill that they lacked in their job performance).**

Data in Table 4.6 shows lack of ICT skills were identified by almost every one 123 (94.6%). Other skills rated by over 50% of the graduates as lacking include: communication, team building, customer care, administrative, diagnostic management and report writing skills.

Learning resource materials are critical to the realisation of positive learning outcomes. In this regard, that researcher sought to find out the status and adequacy of physical facilities and equipment at the IT.

#### 4.4.2 Status and Adequacy of Learning Resources

Data for this section is based on observation.

##### 4.4.2.1 Physical Facilities at the Institutes of Technology

This information is shown Table 4.7.

**Table 4.7 Physical Facilities and their Conditions**

Institution	Classrooms		Workshops		Laboratory		Library		Staffroom/Offices	
	Nr	Cn	Nr	Cn	Nr	Cn	Nr	Cn	Nr	Cn
Guthero IT	34	G	5	P	4	F	1	G	34	F
Meto IT	37	F	5	P	3	F	1	G	9	F
Murigo IT	26	G	6	G	3	G	1	G	15	G
Kireche IT	19	F	5	P	1	F	-	-	12	F

KEY: P-poor Cn-General Condition of the facility  
 Nr-Number F-fair G-Good

#### NB

General Condition (Cn) of the facility gave the overall suitability of the facilities in each IT.

Table 4: 7 shows the number of physical facilities in the Institutes of Technology and their general conditions. The assessment of the general condition of the facilities as good, fair or poor is based on the prevailing status of floors, walls, and ceilings. In addition, an assessment was also made of their capacity and suitability for the current use.

From Table 4.7, it can be noted that it was only in Murigo IT that all the physical facilities were in good condition. In addition, it was also Murigo IT that had a specialised laboratory for Electric and Electronics. In contrast, although three of the four institutes of technology had libraries, they were stocked with old books and lacked capacity to accommodate a large number of students.

#### 4.4.2.2 Equipment at the Institutes of Technology

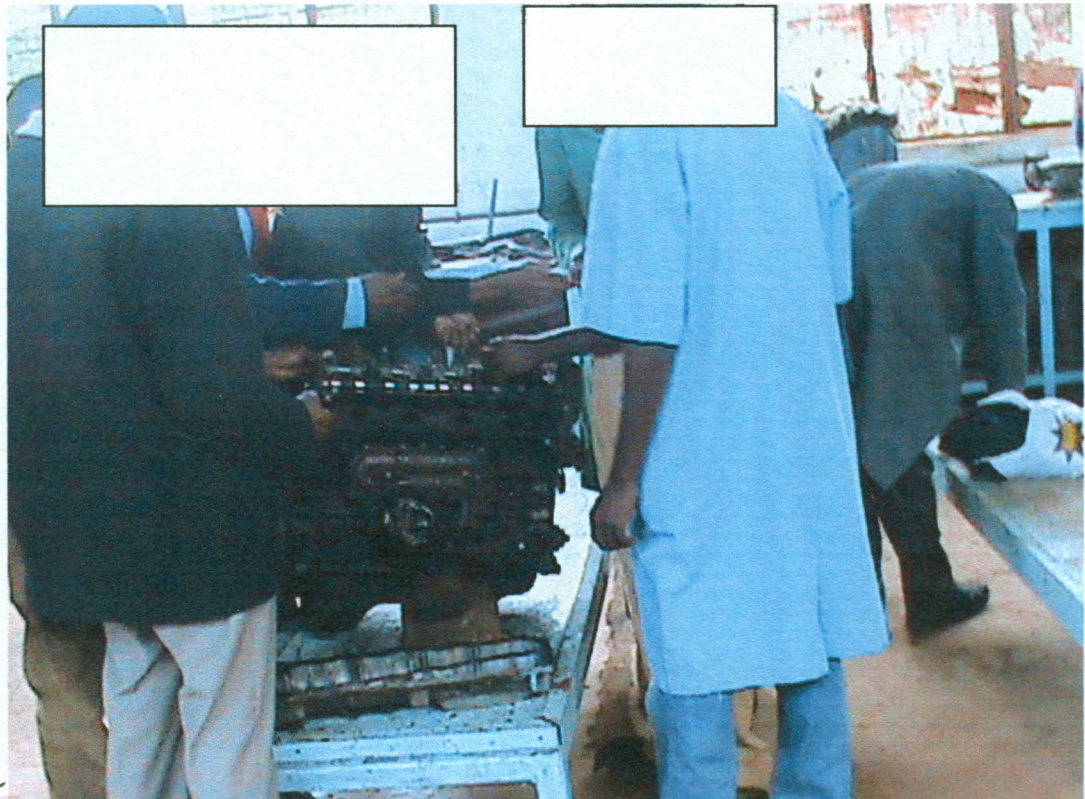
A part from the physical facilities, effective training to a large extent is dependent on equipment. This means that provision of adequate and modern equipment in training institutions is critical. This data is shown in Table 4.8.

**Table 4.8 Equipment Status**

<b>Institution</b>	<b>Obsolete %</b>	<b>Working %</b>	<b>Need repair %</b>	<b>Compatible with current Technology %</b>
Meto IT	12	28	60	25
Guthero IT	13	42	45	29
Murigo IT	22	38	40	33
Kericho IT	29	24	47	14
<b>Average</b>	<b>19</b>	<b>33</b>	<b>48</b>	<b>25</b>

Data from Table 4.8 indicates that on average 48% of the equipment at the institutes of technology needed repair while only 25% of the equipment were compatible with current technology.

Although there has been a generational change in auto engines from the carburettor of the 1970s or earlier to EFI of the 1990s and the latest engine model VVTI, the IT are still using carburettor engines for training. Observations conducted in the workshops confirmed that most of the equipment in the IT were outdated as they were models from 1970s and many had broken down as can be seen in figure 4.1.



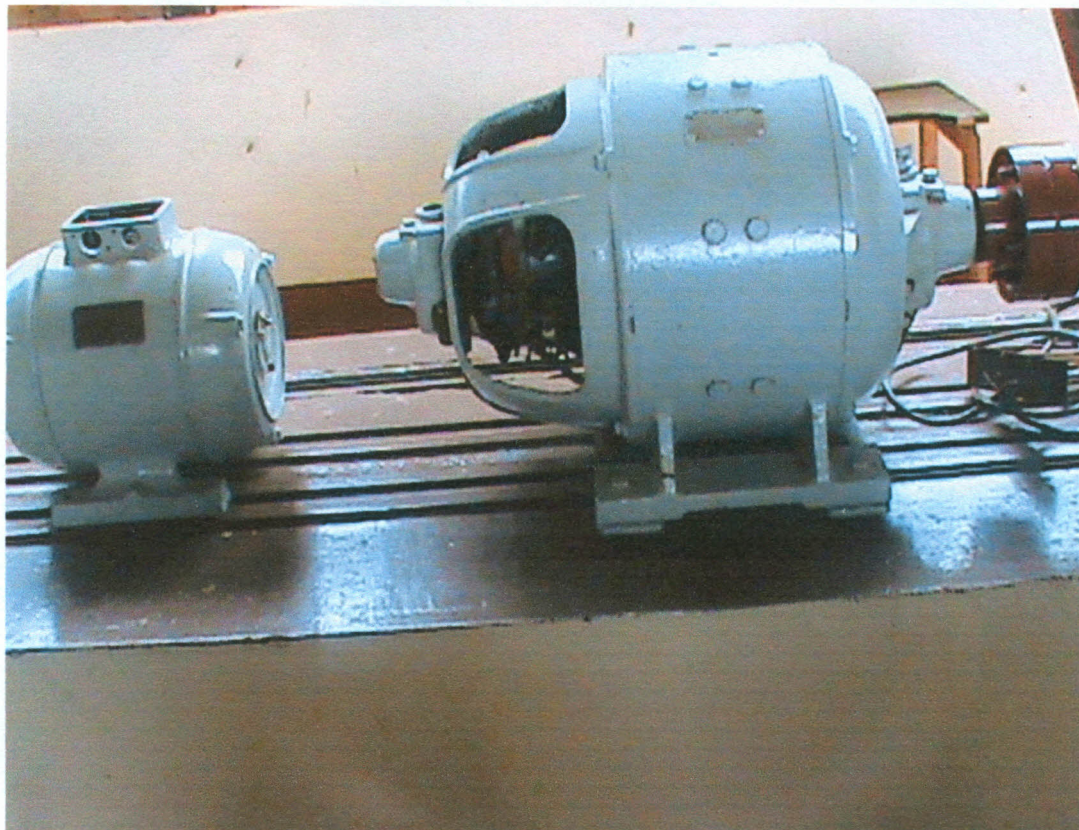
**Figure 4.1 Students during a practical class in mechanical automotive workshop**

Figure 4.1 shows a group of students in a practical class, learning the use of outdated carburettor motor vehicle engine that was in use in the 1970s instead of the current EFIs or latest engine model VVTI. Figures 4.2 and 4.3 illustrate the EFI and VVTI engine models that are currently in use in the labour market. This means that when the IT graduates get employed in an auto repair shop, the types of vehicle engines they are



**Figure 4.3 An VVTI motor vehicle engine in an auto repair shop**

Further, observation of equipment at an Electric and Electronics Workshop in one of the IT showed an out-modelled generator being used for training. The researcher's observations revealed that the generator had in fact broken down. Figure 4.4 depicts this generator which was a 1960s model that had been donated by the German Technical Assistance (GTZ), in the 1970s.



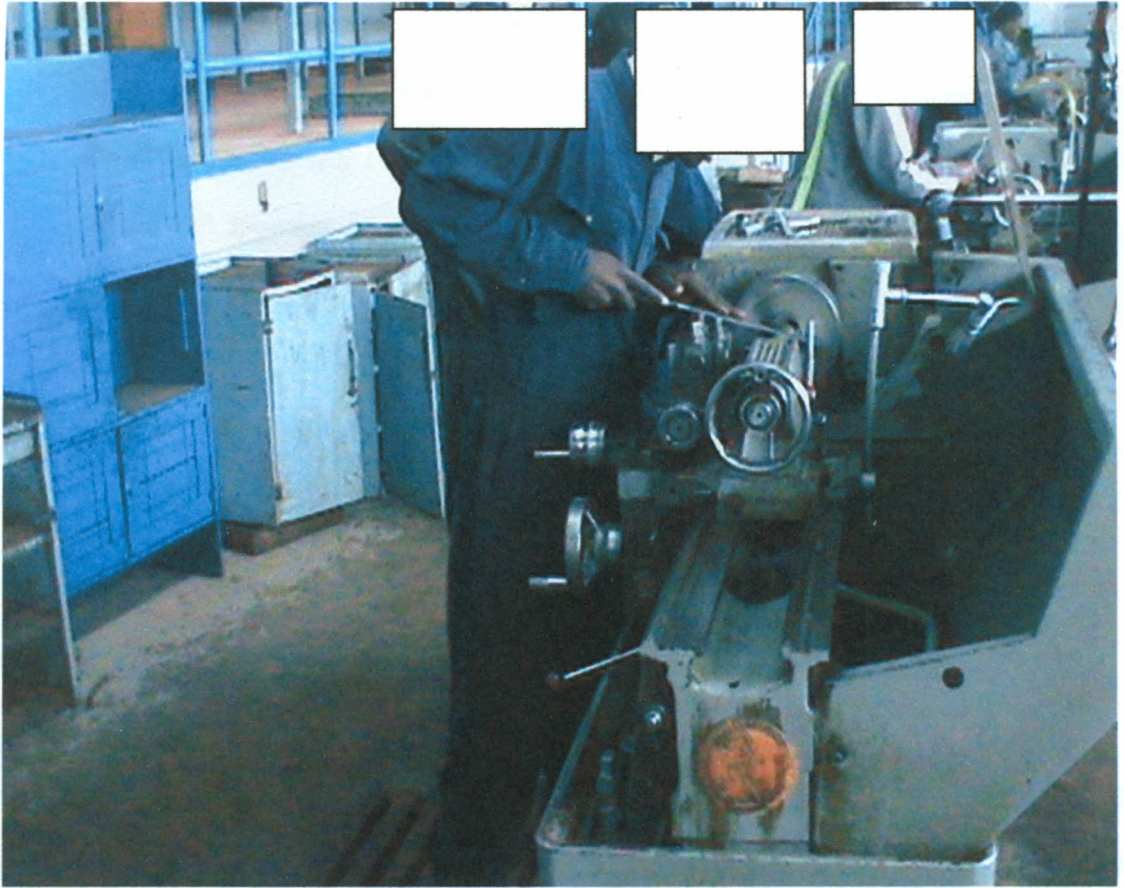
**Figure 4.4 A generator at the electric and electronics workshop**

This model of a generator is totally different from the modern generators in use in the labour market today as depicted in figure 4.5. Unlike the modern generators like the one shown in figure 4.5, the one in figure 4.4 is manually operated and such models are no longer in use at the labour market.



**Figure 4.5: A modern generator as found in the industry**

By comparing the two types of generators, it is evident that there was a discrepancy between the machines and equipment used for training at the IT and those used in the industry. As a result, there was a mismatch between the skills acquired at the IT and the skills required in the labour market.



**Figure 4.6 Graduates during a practical lesson in a production workshop**

Evidence provided from the observation of facilities and equipment confirmed the graduates' views that facilities and equipment such as the workshops and laboratories were insufficient; while the equipment and machines had either broken down or were outdated. The learning materials in engineering courses were old and equally inadequate. The foregoing views and evidence from observation suggest that graduates were trained using outdated equipment and therefore they may not have acquired skills required in the labour market.

Findings regarding the status of equipment and other facilities in IT seem to complement those from the Government of Kenya report's on 'Audit of Staff, equipment, infrastructure and other training resources in Technical Training Institutes and Institutes

of Technology (MoEST, 2005). This report found that some of the equipment in the IT were outdated and not compatible with the modern technology as they had been acquired in the 1970s through the development partners such as Canadian International Development Agency (CIDA), European Union (EU), Germany Technical Assistance (GTZ) and Japanese International Cooperation Agency (JICA) and Italian government (RoK, 2003).

In further attempt to establish how well the graduates were prepared for the labour market the researcher interviewed immediate supervisors of the IT graduates.

#### **4.4.3 Supervisors' Views on the Relevance of Knowledge and Skills acquired by Graduates to the Needs of the Labour Market**

Of the 15 supervisors interviewed, some 5 (33) % of them were of the opinion that the graduates were somehow fairly well prepared although they lacked ICT skills and practical skills on how to operate modern machines and equipment. The general opinion from the Building and Civil Engineering sector was that the graduates and especially those from the craft level were fairly well prepared save for the use of modern machines that are automated. A respondent from a construction company explained:

The masons, carpenters and plumbers we have from IT are okay when it comes to manual work that does not require operation of modern machines unless they have learnt their operation on the job. If he is a mason, he is well versed with how to mix a good workable concrete, in good ratios so that the walls or floor of the house do not crack or the house collapses. He is able to set a good building in an accurate way either by laying of stones and construction of beams and columns and floors. Unfortunately, that is what we would call a good traditional mason who is outdated today as most of the construction work is not manual but machine operated which they do not know how to operate! (Supervisor, construction engineering sector).

The sentiments expressed above seemed to agree with the sentiments expressed earlier on by some graduates during the interviews. However, although some of the supervisors

were satisfied with the technical competence of the IT graduates, some of the comments the supervisors made pointed to the need for much closer links between what is taught and the tools and practices of the workplace. For instance, one supervisor had this to say:

...the technical skills possessed by IT graduates are not as up-to-date as the systems/processes used in the job environment. Graduates need more exposure to industry standard tools used in practical real world situations. Specifically, the graduates lack specific technical skills in the areas of electrical/electronic diagnosis and troubleshooting, air condition diagnosis; head & block resurfacing and radiator repairs.

Further, this supervisor explained that although certificate graduates from IT were fairly good in practical aspects of their job such graduates were poor in generic skills in speaking, reading and writing. Generally, the immediate supervisors voiced different opinions in regard to the IT graduates' level of preparedness. Some of their views are presented as follows:

...the graduates are not well prepared. They lack hands-on-the-job experience. They have a lot of knowledge in theory and not technical skills. They lack experience on how to operate 'live' machines. They also lack ICT skills which call for a need for them to be retrained. You see, almost all the machines we use are electronically driven but you know all these graduates were trained using manual machines and this is a challenge to them as they do not know how to operate the machines that we have here (A shop manager, Auto repairs shop).

...not well prepared. Once we recruit fresh graduates, there is always a programme to induct them. Theoretically, I would say they are to some extent well prepared, but practically they are not! The machinery we have around here is modern compared to what has been used to train them at the local IT. The process of re-training them puts a lot of strain on the company in terms of out put. The production process is slowed down and this is expensive for the company ( A supervisor, cable production shop).

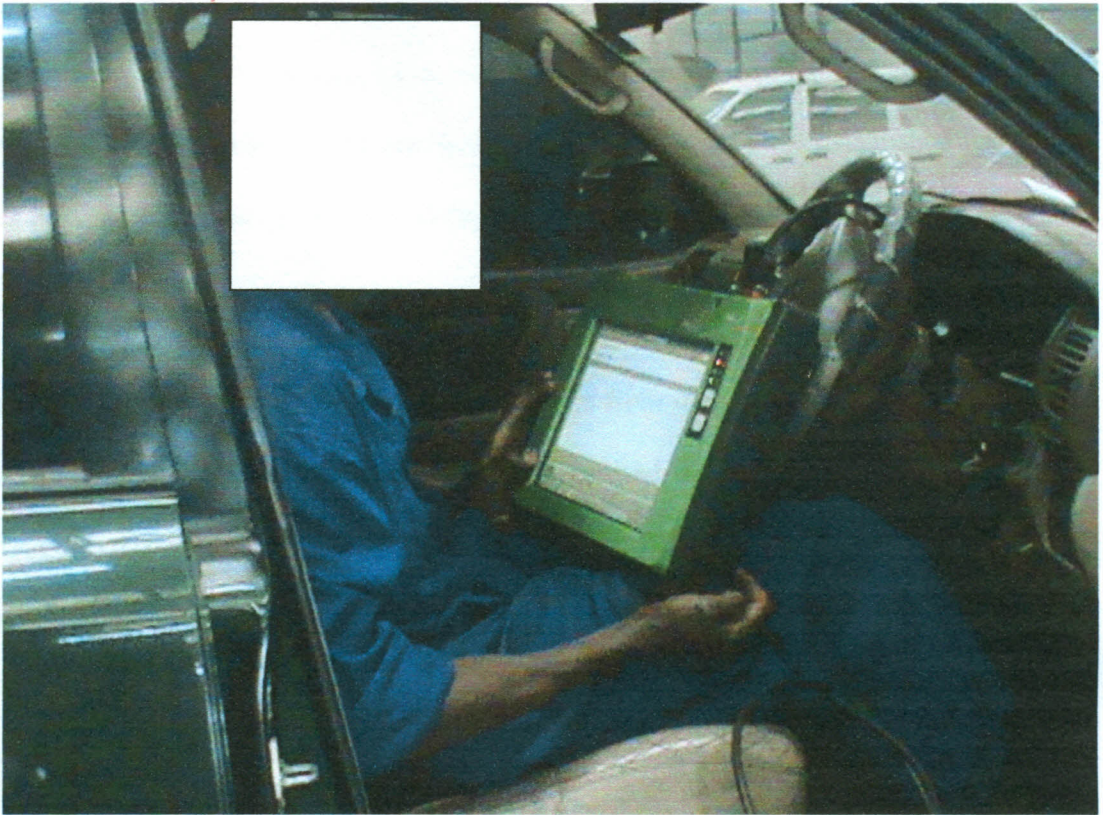
...the graduates must be re-trained. There must be an induction period for up one year and beyond depending on the ability of the graduate to understand and learn on the job. This is a result of the mismatch between the facilities and equipment used to train them on one side and the current and modern facilities and equipment found in the company like this one. For instance, in automotive engineering today the vehicles in the market have what we call VVTI engines and not the carburetor type that is being used in training institutions (A supervisor, Auto shop).

The views expressed in the above excerpts by the supervisors are in agreement with the sentiments expressed by the graduates who pointed out that they were not well prepared due to lack of adequate facilities and modern equipment. One supervisor also pointed out that although some IT diploma graduates were well prepared in theoretical knowledge while the certificate graduates were well prepared in practical skills, they required to be re-trained on the use of modern machines and equipment that are in use in the labour market. He further went on to explain that re-training some of the graduates on the job was expensive as it ranges from one year or more. Moreover, he pointed out that process of re-training the graduates was not only an expensive venture for the employers but slowed down production in the company or services rendered. As a result, this impacted negatively on the companies that were profit making. Consequently, he said, most companies were hesitant to employ fresh graduates from IT. Instead, they preferred to hiring employees with some work experience.

Apart from lack of sufficient technical practical skills, all the 15 (100%) supervisors interviewed concurred that the IT graduates lacked ICT skills that were considered key in their daily job performance. Specifically, supervisors in motor vehicle sector pointed out that ICT knowledge was paramount because the equipment in use were automated and hence it was mandatory for one to be well versed in ICT knowledge to operate them. While stressing the importance of ICT knowledge, one supervisor from an auto garage explained, *'Many auto dealers today are putting their manuals on line. Workers are required to be able to read, understand and use information that is provided in print and electronically'*.

He further explained that currently the technology in motor vehicle industry was advanced. He pointed out that diagnosing mechanical faults in motor vehicle

engines was no longer done manually. Instead, a computerised diagnostic machine is connected in the system to diagnose all the problems. Figure 4.7 shows a diagnostic computerised machine in use.



**Figure 4.7 A diagnostic computerised machine in use**

In addition to lack of technical and ICT skills, graduates' skills in problem-solving, decision-making, communication, interpersonal relations, ability to work in a team or to work individually, and the ability to take initiative were identified by the supervisors as areas for improvement. In the supervisors' views, the IT graduates were ill prepared for the labour market.

Apparently the graduates and the employers are in agreement that the IT graduates were not adequately prepared with knowledge and skills required in the labour market. At the same time data derived from observation provided evidence that there was a discrepancy between the equipment used for training at the IT and those found in the labour market. This means that the IT graduates so trained did not meet the requirements of the labour market. This finding concurs with the World Bank (2004) report that established that the skills in Kenya firms are deficient and there is weak linkage between the skills training institutions and firms.

Again, this finding complements the recent findings from the government research based report presented on October 7 at a workshop organised by the Ministry of Youth and Sports (Opiyo, 2010). According to this report, employers have a problem with graduates from youth polytechnics and other vocational training centres. This is because these graduates require to be 're-trained for another six or so months to familiarise themselves with prevailing job requirements and dynamics'. The report titled, '*Skills Gap Analysis for Graduates of Youth Polytechnics, Vocational Training Centres and out of School Youths*', further states that the employers have a problem with these graduates because the training they get does not expose them to the present realities in the job market.

In addition, the report says, '*The common observation by many employers is that the graduates from these institutions struggle at work because they have difficulties using modern equipment*'. For instance, according to this report, in trades such as motor vehicle mechanics, '*Trainees are taught using old engine models and are not able to handle modern vehicles unless they undergo extra training at the place of work*'. In conclusion, the report points out that there is disconnect between the skills offered by the training institutions and those demanded by industry.

#### **4.5 What Challenges are encountered by Institutes of Technology in their Efforts to Prepare Engineering Trainees for the Labour Market?**

The researcher was interested in finding out challenges that are faced by the training institutions in their effort to link training to the labour market needs. This was because such challenges have a bearing on the quality of the training offered. Data for this was derived from two sources: analysis of the government reports such economic surveys and education reports and interviews with lecturers and heads of department.

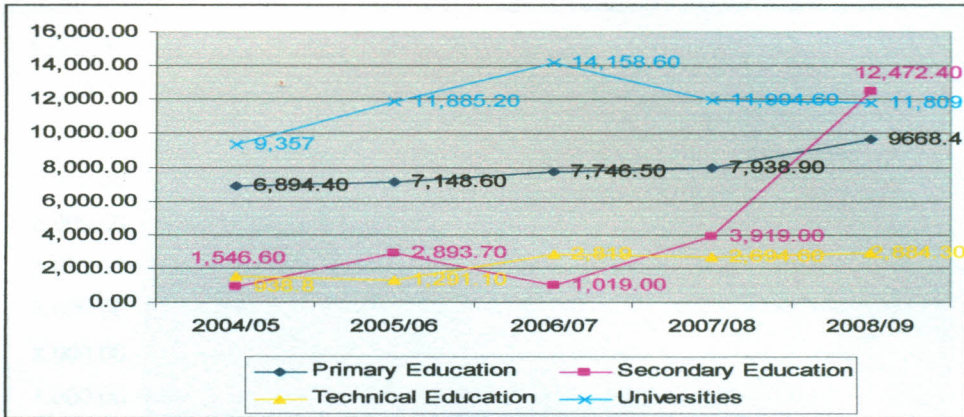
Some of the challenges such as inadequate facilities, equipment, and outdated curriculum have already been covered earlier in this study. Consequently, the challenges covered in this sector are specifically related to linkage between the training institutions and industry. These are: financial constraints, capacities and preparedness of lecturers to implement TEP curriculum, industrial attachment as a strategy to link education and training to the needs of the labour market, ICT and trainees' characteristics.

##### **4.5.1 Financial Constraints**

A review of economic surveys (RoK, 20004; 2005; 2006; 2007; 2008; 2009) revealed that although expenditure on education has been on the increase (to an average of about 35% of the national budget), the allocation to TVET sector has consistently been low. In addition, out of 105,204.5 million shillings proposed in the Kenya Education Sector Support Programme (KESSP), only 3,370 million shillings is earmarked to support TVET programmes. This represents 3.2% of the total allocation. This low budgetary allocation for the TVET sector is not in keeping with the prioritization of TVET in Vision 2030. Other than the government budgetary allocations, there has been little technical assistance or donor support from development partners towards technical education at all

Repeated

assistance or donor support from development partners towards technical education at all levels in recent years (MoHEST, 2008). Figures 4.8 and 4.9 illustrate Government's funding in the education sector in Kenya.



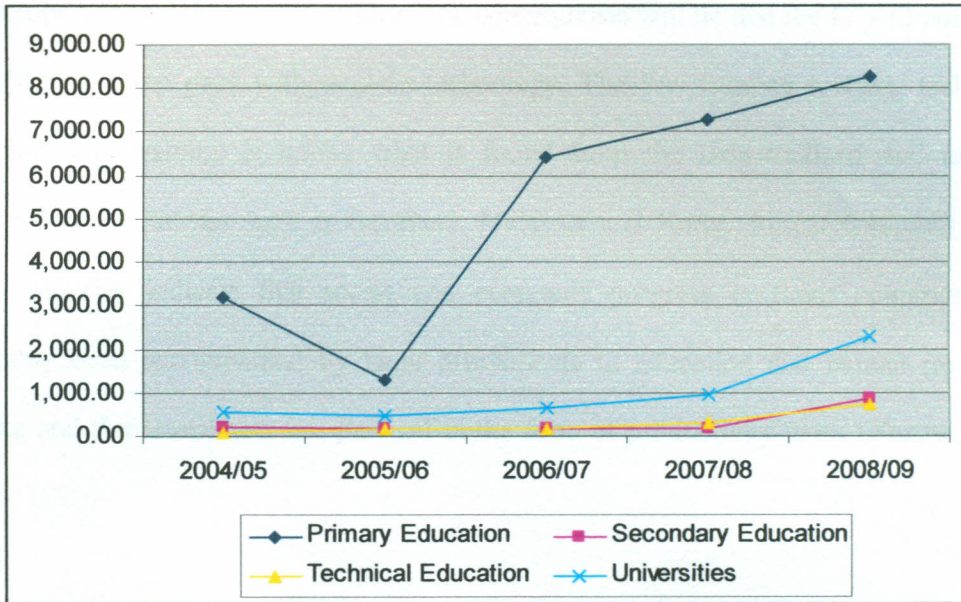
**Figure 4.8 Recurrent expenditure trend for various education levels in Kshs. Millions (2004/05-2008/09)**

*Source: Economic Surveys 2004-2009*

From Figure 4.8, it can also be noted that even general education like primary and secondary school levels receive more funding from the government than technical training institutions. It is only in the year 2006/2007 that technical education received slightly more funds than secondary education.

If TVET institutions get low funding, it means that research and human resource development activities will be compromised. Likewise, the institutions will not be in a position to purchase relevant learning materials and modern equipment. This raises the question of quality teaching and this may have negative implications on the finished products. If the education and training achievement of graduates is inadequate, there must be a question about graduates' skills in the labour market and specifically on their potential to accelerate the country into NIC status.

When we look at the general development expenditure, the same trend of low funding is replicated. This means that technical education still gets the least funding from the government. Figure 4.9 illustrates the general development expenditure.



**Figure 4.9 General development expenditure provision trend for various education levels in Kshs. Millions (2004/05-2008/09)**

*Source: Economic Surveys 2004-2009*

From Figure 4.9, Technical education got almost no funding from the government in terms of development funds compared to other tiers of education such as primary and university education. This is despite the major role that TVET institutions are expected to play if the country is to achieve NIC status by the year 2030. Besides, in the Report of the Education Sector Review (RoK, 2003) and in the Kenya Vision 2030 document (RoK, 2007), there is a clear recognition of the role of education and training in contributing to the projected GDP growth with particular emphasis on TVET.

Although, government documents such as the Report of the Education Sector Review (RoK, 2003), acknowledged the need for higher technical skills and modern technology, with such low financing trends, it may not be possible to ensure quality training given that development funds are vital in acquisition of equipment, building laboratories and workshops, and upgrading of facilities. The consequence will be that the IT will not be in a position to keep pace with modern technology. The low funding towards technical education and training is unlike what is found from the industrialized and rapidly industrialising countries such as Germany, Malaysia and Korea. Research reports from these countries indicate that social and economic progress in those countries has invariably been accompanied by large investments in education and human resource training and this investment has paid off in the form of productivity gains (Kanawayt & Castro, 1990).

This finding also supports Nyerere's finding that, while developed and developing countries such as Italy, Sweden, Japan, Brazil, and China have given more recognition to TVET through adequate funding, this has not been the case for most African countries, Kenya included (Nyerere, 2009). Moreover, according to Mureithi (2008), TVET in Africa has been left to the periphery and its significance has not really been embraced as it is poorly funded.

In addition, this finding complements other studies by Gachino, (2006), Mureithi (2008) & Ngerechi (2003). According to Gachino, (2006); Ngerechi, (2003) & Nyerere, (2009), funding TVET in Africa is ad hoc and arbitral. Technical Vocational Education Training centers have been neglected or taken over by institutions concentrating on purely

academic education. In addition, people tend to view TVET negatively, as education and training meant for those who have failed in the society.

According to the lecturers, financial constraints experienced at the IT is a major hindrance to expansion of facilities and acquisition of modern equipment for effective teaching and learning that is relevant to labour market needs. One lecturer had this to say in regard to lack of specialised laboratory for Building and Civil Engineering programme:

In soil mechanics, we are supposed to teach the trainee how to identify properties of soils with a view to giving the trainees the right skills on how to identify how to lay a good foundation for buildings depending on the nature or strength of the soil. This is to say this unit is meant to equip the trainees with the right methods of construction in a particular soil. For example, if you have a swampy place, you don't expect to lay a foundation in a swampy place that is similar to one that is laid in a firm ground. For the trainees to be able to distinguish various soils suitable for a given form of foundation, we need to carry out certain tests in the lab to determine strength of the different types of soils and such like things. So without such a laboratory, we do not practically teach the concept of soil mechanics and therefore the students rely on theoretical knowledge (A Lecturer Building and Civil Engineering).

According to the lecturer quoted above, it can be said that due to lack of facilities like specialised laboratories, teaching and learning at the IT is majorly theoretical which disadvantages the graduates in the labour market. The lecturers further explained that it is due to financial constraints that IT are not in position to organize field trips for the trainees to relevant industries to expose them to modern technology and real world of work. In addition, the lecturers pointed out that, it is due to lack of finances that IT are not able to assess trainees during industrial attachment.

#### **4.5.2 Capacity and Preparedness of Lecturers in Implementing TEP Curriculum**

The delivery of quality training is highly dependent on the competence of the trainer; competence measured in terms of theoretical knowledge, technical and pedagogical skills as well as keeping abreast with new technologies in the workplace. The role of teachers

in achieving quality training cannot be overemphasised. In the report of Inquiry into the Education System in Kenya (RoK, 1999) it was noted that, ' *the quality of education and training depends largely on the quality of teachers; that is level of academic qualification and professional qualification (RoK, 1999 p. 387).*

The above quote identifies quality of teachers as being very important and enumerates attributes that may enhance quality teaching such as good academic and professional qualifications by the teachers. In order to make training relevant to the needs of the industry, it is essential that the training institutions have enough trainers who are adequately trained and that the trainers acquire regular industry-based technological skills through industrial attachment (MoEST, 2005). Through this exposure, the trainers would get acquainted with the current technology and as such this would enhance the trainers' capacity to deliver relevant training. It is out of concern about teacher preparedness that the researcher sought to find out staffing status of the IT, the lecturers' professional qualifications and whether the lecturers have sufficient industrial exposure.

Table 4.9 shows the number of lecturers teaching engineering courses at the IT.

**Table 4.9 Number of Lecturers Teaching Engineering courses in the four IT by Gender and Employing Agent**

INSTITUTION	N=129					
	TSC			BOG		
	M	F	Total	M	F	Total
Meto	25	-	25	5	-	30
Guthero	25	-	25	7	-	32
Murigo	28	4	32	6	-	38
Kireche	21	-	21	8	-	29
<b>Total</b>	<b>99</b>	<b>4</b>	<b>103</b>	<b>26</b>	<b>0</b>	<b>129</b>

**Key:**

- (i) TSC – Teachers Service Commission      (ii) BOG – Board of Governors

Table 4.9 shows that there were 129 lecturers teaching engineering courses at the four IT. On further analysis, Table 4.9 shows that 125 lecturers were male while only 4 lecturers were female. On the other hand, data from this table indicates that 26 lecturers were employed by the Board of Governors (BOG) while those employed by the Teachers Service Commission (TSC) were 103. Of the 25 lecturers employed by the BOG, college Kireche IT had the highest number (8) and it was closely followed by Guthero (7). On the other hand, Murigo and Meto had 6 and 5 BOG employed teachers respectively. BOGs employ trainers only when those employed by TSC are inadequate. This means that all the IT were understaffed as some lecturers in all the four IT had been employed by the Board of Governors (BOG) to ease the shortage. On average, there was a shortage of 4 lecturers per department. Shortage of lecturers is an impediment to relevant training because it means that sometimes the learners' lesson would go unattended.

To supplement the findings from documentary analysis on staffing at the IT, the heads of departments were asked whether the lecturers in their departments met the teaching needs of the departments. Out of the 12 departments, only two had enough lecturers. While commenting on staff shortage, one head of department remarked, '*We are understaffed and therefore have heavy work load that inhibits effective teaching*'. He further explained that although one lecturer had been employed by the BOG to remedy the situation, not much had been achieved as some lecturers in his department were forced to teach up to 24 hours per week against the TSC recommended 16 hours. As a result, he said, some lecturers had to teach during the weekend. He explained thus:

We have only 3 degree holders who are not enough to teach all the diploma classes. This implies that diploma teachers are teaching students at the same level (diploma). Lecturers are also overloaded. Some teach 24 hours and have to sometimes teach over the weekend to make up for the lessons not taught during the week (Head, Electrical and Electronics Department).

Other Heads of Department while explaining that their departments lacked enough lecturers also explained as follows:

We have shortages in automotive engineering and production. We have a shortage of 4 lecturers (Head, Mechanical and Automotive Engineering Department).

As at now we are not enough. We are 8 but 11 lecturers would be sufficient. In carpentry and joinery we have only one lecturer who is therefore expected to do all the work (Head, Building and Civil Engineering Department).

From the explanations given by the Heads of Department above, it can be noted that staff shortages had implications on teaching/learning. This is because the teachers who are overworked cannot be productive. At the same time, the issue of inadequate staff implies that the training institutions may lack highly qualified lecturers as explained by one head of department who pointed out that in his department, there were only three lecturers with degrees while the rest (5) were diploma and certificate holders, some of whom taught trainees at the same level of their qualification.

The lecturers' professional qualification is considered critical in this study because well trained teachers have a bearing on the trainees' achievement (Murnane, 1975; Husen, Saha & Noonan (1978); Psacharopoulos & Woodhall 1985; & Kaime, (1990). It is for this reason that the researcher sought to find out the lecturers' professional qualifications. Information on this is provided in Table 4.10.

**Table 4.10 Lecturers' Level of Professional Training**

N=129		
Level of training	Frequency	Percent
Certificate	7	5.4
Diploma	78	60.4
Higher National Diploma	22	17.1
First Degree	16	12.4
Master Degree	6	4.7
PhD	-	-
<b>Total</b>	<b>129</b>	<b>100.0</b>

Table 4.10 shows that there were no lecturers with PhD. It is clear from Table 4.10 that a large number of the lecturers are diploma holders. In addition, there are seven lecturers who are certificate holders. This reality raises fundamental question of the capacity of the lecturers in the IT to carry out research and translate it into practical activities to develop the nation.

To probe further on the adequacy of lecturers' professional training, the Heads of Departments were asked to explain whether the lecturers in their departments were adequately trained. Technical education lecturers are trained at the Kenya Technical Training College (KTTC) {which was established in 1978}. The college offers a one-year diploma to technical education diploma holders who are trained to teach technical training institutions.

In response, only one Head of department out of the twelve interviewed was of the opinion that the lecturers in his department were adequately trained. He explained that he believed that the lecturers in his department were adequately trained because they taught students who passed well. Otherwise, the other eleven Heads of Department felt that although the lecturers are well trained to a certain level, that is certificate or diploma they

needed to upgrade themselves so that none of them would teach trainees at their level of professional qualification. Their views are captured below:

They are well trained but they need to be upgraded to higher levels like degrees and post graduate level so that they can be competent in teaching diploma or higher diploma levels (Head, Building and Civil Engineering department).

The training is not adequate. We have only one degree holder in the department and it is very challenging because he is the only one who handles maths for the diploma classes (Head, Electric & Electronics Department).

Not really. Due to change in technology there is need to upgrade the lecturers through further training (Head, Mechanical and Automotive Engineering Department).

Lecturers are not adequately trained because most of them were trained very long time ago and the requirements of their work have changed over time. They do not have a grip on the modern technology (Head, Mechanical and Automotive Engineering Department).

In short, from the above excerpts, the respondents were of the view that lecturers needed to professionally upgrade themselves since majority of them were diploma holders. In addition, most of them were trained a long time ago and so much has changed in technical education and training due to technological changes taking place in the world today.

On an interesting note some Heads of Department pointed out that trainers' low professional qualifications were also a hindrance to effective teaching as most of the lecturers in the IT were diploma holders who were also teaching students at the same level. One Head of Department remarked, *'Most of our teachers' professional qualifications are low...most of them are diploma holders teaching at the same level'*. He further explained that his department was not offering programmes in higher diploma due of lack of qualified trainers to teach at that level.

The trainers also voiced their dissatisfaction in cases where the leader at the helm of the college was not a technically-oriented person. According to the respondents, such principals do not know what it takes to train technically skilled personnel in terms of the resources that need to be invested in that field. They felt such principals did not support their endeavours and therefore they faced serious problems in getting even the basic teaching materials. One lecturer pointed, *'Madam, am sorry to say that for the last one month I have been waiting for a response (from the principal) in connection to a requisition I made for some items to conduct practical lessons. I strongly feel that with her background in humanities, she may not understand the importance of practicals to enhance learning in engineering courses'*.

Another challenge facing institutes of technology in their efforts to prepare the trainees for the labour market has to do with the trainers themselves. In general, both the lecturers and Heads of Department pointed out that they were not motivated to work. They cited poor pay, lack of promotion and the dead end nature of their training. These respondents explained that although, there is a policy, a clear path way on how they can upgrade themselves is lacking. The researcher was informed that Moi University, Jomo Kenyatta University of Science and Technology do not recognise the lecturers' current professional qualifications and, therefore, these trainers are expected to start their courses afresh like any other secondary school graduate who has had no prior training.

According to the Sessional Paper No. 1 of 2005, the government was to employ a strategy to address the issues of credit transfer in TVET and universities through collaboration with stakeholders to create necessary linkages and credit transfers between tertiary institutions and the universities was not implemented. Does this mean that up-to-date this policy has not been implemented?

### **4.5.3 Industrial Attachment as a Strategy to Link training to Labour Market**

#### **4.5.3.1 Industrial Attachment for Trainees**

Industrial attachment is an integral part of training in the TEP curriculum. Programmes in technical training have a job attachment component which is intended to expose the trainees to real practical work in the real world of work. Attachment is meant to enhance relevance of technical training to the labour market. Trainees are expected to benefit a great deal from these attachments since in many cases the institutions are unable to keep up with the changing technologies and to provide up-to-date equipment for the students' to practice on. When the students go on attachment, they are expected to get exposed to new technologies and practices at the workplace.

Although the TEP curriculum stipulates that diploma trainees are expected to go out for industrial attachment for six months, it was learnt from the lecturers that the trainees only went out for three months and actually not all the trainees managed to find places for industrial attachment. Moreover, according to the lecturers and supervisors, a three months' industrial attachment was insufficient for the trainees to familiarise themselves with all aspects of their trade. This revelation points to less emphasis being laid on practical experience on hands-on-the job which according to the supervisors was a key requirement in the industry. Lack of adequate practical experience on the job may suggest that graduates were disadvantaged when they were released to the labour market. As a result, this explains why the supervisors argued that such graduates required retraining to familiarise themselves with the modern equipment currently in use in the labour market. This means the graduates do not enter the labour market with confidence as articulated in objective two of TEP curriculum of technical training.

Again, although industrial attachment is an important component that links training to the labour market, some lecturers argued that industrial attachment was flawed as trainees' assessment report heavily relied on the opinions of the student and those of immediate supervisor in the industry. One lecturer lamented that students were only assessed once by an assessor from his/her respective college. He said:

Industrial attachment is not objective because some of the supervisors in industry are not sincere. The attaché may also be protected by industry because of a personal relationship like being a child of a friend. Assessment by our lecturers only takes 30 minutes. Surely, this is not practical! We need to do more than a 30 minutes assessment but due to lack of sufficient funds, we are not able to.

At the same time, this lecturer explained that even the 30 minutes assessment was not based on the trainees performing a given task and then being rated by the assessor. Rather the assessment was based on what the trainees tell the assessor about what she/he has learnt through question and answer method. He further pointed out that due to financial constraints, the college assessors usually would want to take as little time as possible with each trainee so that they could assess as many students per day as possible.

So although industrial attachment is really an important component of technical training, the foregoing discourse suggests that optimal benefits were not reaped from it This was because some colleges did not assess the trainees; and even those who did assess them did so once and for a short period of 30 minutes or even less!

It was further learnt that attachment for the trainees was not taken seriously by the training institutions. This is because industrial attachment is not well coordinated. The supervisors pointed out that the trainees are rarely supervised or assessed. Again, though a very important component of IT training, as it is one main ways used to link training to the world of work, industrial attachment is only used to facilitate a learner to get a

certificate. Consequently, it seemed the training institutions did not take this exercise seriously. The dialogue below explains this view:

**Interviewee:** No because, they assess the trainees only once and other colleges do not assess their trainees at all! It is only Nairobi Technical Training Institute that is somehow keen on trainees' assessment.

**Researcher:** Why do you say that?

**Interviewee:** Some colleges do not even bother to assess them. The trainees are just dumped in the industry and that is all.

The dialogue above indicates that trainees were not monitored and fully assessed during the industrial attachment. This defeats the logic of sending students out for three months if they were not fully assessed to find out if they were learning or not. It can, therefore, be construed to mean that IT just release their trainees for industrial attachment as a formality or just to comply with the policy requiring trainees to undergo industrial attachment.

Another view by some lecturers indicated that industrial attachment did not add value to trainees in terms of acquiring practical skills. To illustrate this point of view, one lecturer explained, '*Some trainees learn nothing from attachment...they just to go there so as to meet the college regulations that one has undergone industrial attachment for three months*'. This lecturer explained that industrial attachment was a challenge as some trainees were given irrelevant menial work during attachment instead of work related to their areas of specialization and therefore they did not benefit from this program.

Further, industrial attachment for the trainees was also a challenge as the training institutions were not able to place the trainees in well established companies where they could benefit maximally. From the discussions held with the lecturers' in-charge of industrial attachment, it emerged that IT faced serious challenges while placing students for industrial attachment. The three lecturers were unanimous that they were not able to

place all the trainees on attachment because all the other colleges in the country including polytechnics and universities release students for industrial attachment at the same time. As a result, there were limited opportunities at the industry and therefore it was not possible to attach all trainees.

In addition, it was established that some reputable companies did not offer opportunities for industrial attachment to the trainees from IT. In support of this observation one lecturer commented:

...the level of technology is very high in the industry e.g. there is the use of computer and automated machines in all areas whereas in college, our curriculum, facilities and equipment are outdated. So most industries are hesitant to accept our graduates for attachment (Lecturer, Building and Construction Engineering Department).

According to the lecturer quoted above, there was a discrepancy between the machines and equipment used in colleges and those found in the labour market. As a result, most industries are not keen to accept their graduates for industrial attachment. On the other hand, another lecturer explained:

We face a major challenge when it comes to placing our trainees in reputable companies like the NK Brothers Construction Company. Most of these big companies usually turn down our requests for the trainees placements. So in the end, we attach the trainees to upcoming contractors who have no modern machines and are only engaged in manual house constructions and the like. In such scenarios, our students do not learn much, they are not opened up to the world of work (Head, Building and Civil Engineering Department).

Industrial attachment for trainees is a very important component of the TEP curriculum. It is critical in the sense that it gives the trainees an opportunity to practice on-the-job and it is mandatory for any trainee to qualify for graduation. In this regard, it is important that students should get attached in companies that have a capacity to offer them relevant exposure.

#### 4.5.3.2 Industrial Attachment for Lecturers

According to Steward, Sabaroche, and Nicholas (2006) industrial exposure for the lecturers is considered critical. This is because lecturers need to have exposure to industrial practices to enable them offer relevant training to the trainees. It is out of this concern that the study sought to find out from the Heads of Department how often the lecturers went out for industrial attachment. According to the 12 Heads Department interviewed, none of the 129 lecturers teaching engineering courses had ever had a chance to go on industrial attachment. The respondents unanimously indicated that lecturers in their departments had never gone for industrial attachment and that it was not catered for by the Ministry of Higher Education, TSC or even at college level.

The excerpts below illustrate the Heads of the Departments' reactions to the question '*How often do members of the academic staff go out for industrial attachment?*' They explained:

Oh, the idea of industrial attachment for lecturers is a policy that is yet to be implemented. Currently, it is more of a personal initiative. This is to say that the onus is on the lecturers to personally initiate industrial attachment when the college is closed or during the holidays. That being the case, it is difficult to be effected because during the holidays, lecturers are engaged in personal activities like school-based education programmes, so unless the government wants the lecturers to go during the term, I do not see it materialising (Head, Mechanical and Automotive Engineering Department).

They have never! It was a government proposal in the year 2005 that the lecturers need to be attached to industry but due to lack of funds it has never picked. As a result the lecturers lack knowledge on new technological knowhow (Head, Building and Civil Engineering Department).

From the excerpts above, it is clear that none of the trainers from the four IT had had any experience of industry since they started training. Heads of Department from Building and Civil Engineering departments hinted that they had a bit of industrial exposure from

the consultancy services they offered mostly when the colleges were closed. On the whole, however, it was found that the trainers in general lacked industrial exposure which was vital in enhancing the trainers' ability to deliver relevant training. If the trainers lack industrial exposure, they would not know the labour market needs and therefore they could not offer relevant training.

In addition, the Heads of Departments pointed out that lack of industrial exposure and regular in-service for the teaching members of staff impacted negatively on training as they were not in touch with the modern technology or what was required by the labour market. According to the lecturers and Heads of Departments interviewed, they had not been going for industrial attachment. They also indicated that there were no formal programmes geared towards industrial attachment. As a result, the trainers' capacity to deliver relevant training was curtailed. One Head of Department explained thus:

Lack of industrial exposure is even worse for the lecturers. For instance, take lecturers who were trained in these technical areas in the 1980s, TSC has not been allowing them time to go for industrial attachments and therefore lecturers are not familiar with modern technology currently in use in industry and yet they are expected to offer relevant training!

According to the above respondent, lecturers in TVET institutions lacked industrial exposure which is essential for them to be able to deliver relevant training. It is through industrial exposure that the trainers get acquainted with relevant modern technological knowledge. Lecturers from the four IT indicated their institutions were not in touch with the industry that absorbs their graduates as there were no established collaborations with them. Another challenge that was voiced by the lecturers as a major hindrance to effective teaching/learning process was lack of computers. The lecturers argued that in the labour market the use of computers or Information Communication and Technology

was greatly entrenched and as such without computer knowledge, their graduates would be completely out of place.

#### **4.5.4 Information Communications Technology (ICT)**

Data for this section was collected through an observation guide and interviews with the lecturers. The role of ICT in education cannot be over-emphasized. The world is going the digital way, and education is at the forefront of this journey. Trends in the region and globally indicate a shift from agriculture-based industries to service and knowledge-based industries (Caribbean Development Bank (CDB), 2007; UNESCO-UNEVOC, (2007); Afeti, 2008; Kinuthia, 2009). This shift requires a swift adaptation of ICTs. In part, the CDB (2007) report states:

‘.....ICTs are critical part of the economic infrastructure that supports production; trade; investment; and capital flows and as such are means by which individuals; institutions; governments; and organisations network, undertake activities and participate in the development process at local; national; regional; and global levels. The key to the revitalisation of regional economies using ICTs will be in creating capacity and the means to implement and optimally deploy a nucleus of skilled human resources’ (p 15).

Although it is globally acknowledged that ICT is important for all occupations, IT in Kenya are still lagging behind. According to Kinuthia (2009), computers were introduced in Kenya in the 1970s and the internet became available in 1993. By March 2008, only 7.9% of the population had access to the internet. While the number of internet service providers continues to grow, access is still limited, especially in the rural areas where most of the ITs are located (Kinuthia, 2009).

Data obtained from observation indicated that the syllabi in ITs programmes did not have ICT component for training and that there were no computers for use by either the teachers or students. Table 4.11 shows the number of computers in each IT.

**Table 4.11: Number of Computers in each IT**

<b>Institution</b>	<b>Number of computers</b>
Murigo	10
Kireche	6
Guthero	8
Meto	6

It is critical to note that the few computers depicted in Table 4.11 were specifically meant for administrative use. Those computers had therefore been assigned to the HoDs, Principals, Deputy Principals and the finance departments. This means that although information and communication technologies (ICTS) play an important role in national development, ITs were ill prepared to offer ICT skills to the trainees. Due to relatively high cost of purchasing and maintaining ICT hardware and software, in relation to the low levels of funding of IT institutions, ICTs were scarcely used at the IT. Consequently, the current level of investments in ICT in the IT does not allow the above benefits of ICT to be realized in Kenya.

One lecturer explained that since there were no computers for teaching, he was forced to train his students how to draw technical drawing manually which was an outdated exercise in the face of the modern technology. He explained:

Madam, can you imagine in this era of computer age if I tell my trainees to draw a plan for you, they will take a T- square and a drawing board and sit here for many hours drawing a plan? Eventually, they will come up with the same thing but they would have taken much less time if they had used computers...so about lack of computers I would say is a major challenge (A lecturer, Building and Civil Engineering Department).

The above sentiments show that ITs have not embraced the use of modern technology although the use of ICT is required in all positions at the work place.

## 4.5.5 Candidates' Entry Qualifications and Social Economic Background

### 4.5.5.1 Candidates' Entry Qualifications

Apart from lack of facilities and learning resources in general, majority of the trainers pointed out that trainees entry qualifications were also a major challenge. Out of the 12 Heads of Departments interviewed 8 (67%) of them pointed out that the academic requirements for entry were very low. At the same time, the issue of poor qualification was raised by 9 (75%) of the lecturers out the twelve interviewed. In general the trainers were of the opinion that trainees' poor education backgrounds were a major challenge to acquisition of relevant theoretical knowledge and skills. During the interview with one Head of Department, he thus explained:

The diploma students are admitted with a mean grade of C minus. But that C minus is an aggregate of what? My goodness, it is passes in History, C.R.E, Agriculture, and the like. And that is where the major problem lies because it is better to have somebody with a mean grade of D but has passed in Physics and Mathematics. For the engineering courses, a person with a D but who has passed in Mathematics and Physics is better than someone who may have a good grade or even A but who has passed only in commerce, agriculture or in Arts related subjects. We admit them with poor grades because we need to fill a class in line with the Ministry of Education requirement that stipulates that an examinable class must have at least 10 students. It therefore takes such trainees who have not passed in Maths or not even done physics all together, a lot of time to comprehend the engineering concepts. As a result, the failure rate is high e.g. out of a class of 18 students we had last year only three students passed examinations. Eight of the trainees had supplementaries while the other seven failed (Head, Mechanical and Automotive Department).

The above quote suggests that poor basic education achievement by trainees limited skills' achievement by such trainees. He attributed high failure rate by the trainees to poor entry qualifications. From the lecturers' argument that the official admission criteria used to place candidates in IT was not good enough, then this means that there is a problem that needs to be addressed urgently.

The other thing that emerges from the last excerpt is the fact that there was strict KNEC policy that stipulated that an examination class must have a minimum of 10 students. To meet this requirement, IT are forced to admit candidates who were not really qualified by picking candidates with a mean grade of C minus for diploma courses regardless of whether they had passed in cluster subjects (Maths and Physics). Admission of poorly qualified candidates has a bearing on education and training learning out comes. Such learners might not easily acquire the knowledge and skills demanded in industry.

Laxity on the part of the students was indicated as another major challenge that faced lecturers in their effort to adequately equip the graduates with relevant skills for the labour market. The respondents gave the following views:

Another problem has to do with the individual learners. These students tend to relax too much instead of working hard in their studies. They only wake up the last minute when the national examinations are around the corner. Unfortunately, many of them do not make it in the examinations. They simply fail since they are ill prepared. (Lecturer, Mechanical and Automotive Engineering Department).

Our students' commitment to learning is another challenge. You see today's learners are not like us. We used to work very hard. These days students are just loitering most of the time; they waste a lot of time. There is no seriousness on their part. Many of the students are engaged in romantic relationships at the expense of learning and this is why they fail in large numbers (Head, Mechanical and Automotive Engineering Department).

#### **4.5.5.2 Trainees' Social economic Background**

Poverty was also singled out as one of the major challenges. It was learnt that since most students came from poor backgrounds, a lot of time was wasted when students were sent home to collect fees. According to the respondents, some of students would take even a month before coming back to college with part of the fees while some students would eventually drop out all together. One lecturer explained, *'Some of the parents/guardians are so poor that their children lack basic tools like Mathematical sets and calculators. Consequently, you find students borrowing such items even during examination time.'*

In addition, the lecturers pointed out that due to poverty, some of trainees did not complete their industrial attachment. Drop out rate was also high due lack of finances for subsistence use. It was also pointed out that students normally failed to get attached to industries where they would benefit maximally due to lack of funds for subsistence upkeep. A lecturer pointed out, *'As such, students sometimes preferred to be attached within the locality for convenience as opposed to industries in towns where they might benefit more'*. It was therefore learnt that most graduates got attached in the local tea factories, coffee factories and sugar companies.

#### 4.6 Participants' Suggestions on how to Improve TVET

The respondents who participated in this study gave suggestions meant to improve technical training at the IT in Kenya. The graduates were asked to give their recommendations through an open-ended question. The respondents therefore gave their recommendations as shown in Table 4.12.

**Table 4.12 Recommendations for Improving Technical Education and Training**

N=130		
Recommendation**	Count	Percent
Provide modern tools & equipment	110	84.6
Practicals should be emphasised	90	69.2
ICT education	69	53.0
Provision modern learning materials	51	39.2
Provision of bursaries	39	30.0
Field Trip/ educational trips	27	20.7
Enough lecturers	20	15.3
Employ youthful lecturers with knowledge in modern technology	16	12.3
Well trained teachers	12	9.2
Industrial attachment to take six months	12	9.2
Curriculum should be reviewed	12	9.2

(\*\*This was a multiple response question where respondents could give more than one recommendation).

Data from Table 4.12 shows that majority of the respondents 110 (84.6 %) recommended that training institutions should be provided with modern tools and equipment. On the other hand, 90 (69.2%) graduates recommended that technical training institutions should put more emphasis on practical skills acquisition than theory. Other recommendations included; inclusion of ICT skills in the training, provision of modern materials such as text books, and provision of bursaries.

The Heads of Departments and the lecturers gave recommendations that were similar to those given by the graduates. They all recommended that the TEP curriculum be reviewed urgently with the involvement of all stakeholders so as to make it relevant to the needs of the labour market. In addition, they felt that the curriculum should be reviewed so as to include the ICT component which is essential in industrial careers.

During the interview, lecturers expressed their views as follows:

Let this thing we call the syllabus, be reviewed in order to incorporate computer or ICT new technology, new materials, new approaches and; let our lecturers be involved in the preparation of all the teaching materials including the syllabus (A lecturer, Building and Civil Engineering Department).

The current TEP curriculum is outdated. It needs to be reviewed urgently so as to respond to the needs of the labour markets. Let the industry be involved in that process. Secondly, modern learning resources, facilities and equipment should be provided and more teachers employed in areas where there are shortages (A lecturer, Electrical and Electronics Engineering Department).

The lecturers and Heads of Department also suggested that they should be involved in curriculum review and development because they are responsible for implementing it.

One Head of Department commented:

Although we are the people who implement the curriculum, the KIE does not consult us during curriculum review or development. They do it on their own and therefore, we are not surprised when we look at the syllabus and realise that even the time allocation for a particular topic is impractical, you now wonder how you can cover it. Our role has been narrowed down to mere implementation! We need to be more involved (Head, Building and Civil Engineering department).

On the other hand, both the Heads of Department and lecturers recommended that the existing facilities such as the workshops, libraries and specialised laboratories for teaching the engineering programmes should be provided or modernised for the purposes of achieving effective learning outcomes. In addition, they recommended that IT be adequately equipped with modern equipment and machines as most of the equipment currently is either outdated or broken down; and that Kenya National Examinations Council should focus more on practical aspects of the training than theory. Further, the lecturers and Heads of Department recommended that the Ministry of Higher Education in conjunction with Teachers Service Commission (TSC) should facilitate industrial attachment for the lecturers. This would entail lecturers to be given at least six months off their busy teaching schedules so as to be attached in industry for purposes of learning.

Lastly, they recommended that the government should raise the admission criteria to IT from the current requirement of C Minus for diploma and D plain for certificate courses. At the same time, they recommended that a good pass in maths and physics should be a compulsory requirement for admission to IT.

The employers/supervisors on their part made the following recommendations. First, that programmes in IT should include components of ICT so as to equip the trainees with the relevant ICT competencies. In addition, the graduates' skills in problem-solving, decision-making, communication, interpersonal relations, ability to work in a team or to work individually, and the ability to take initiative were identified by the employers as key areas for improvement. Second, they recommended that they should be involved in curriculum development and review so that their views would be incorporated so that the graduates could be equipped with employable skills.

Third, that institutes of technology should closely monitor and assess their students during industrial attachment to ensure that the trainees are doing and learning what is expected of them. In addition, they recommended that lecturers or trainers be regularly attached in industry so that they could familiarise themselves with the use of modern tools and equipment. In addition, they could benefit from the expertise available in industry as well as obtain inputs for programme review and development that could better meet the needs of the employers. Further, the employers recommended that curriculum developers and the training institutions should conduct needs analysis so as to be able to tailor the training programmes to the needs of the labour market.

On the other hand, the supervisors suggested that there is need for the training institutions to initiate close ties with industry (by forming alliances) so that both parties can benefit and support each other. They also called upon the government to give some incentives to industries so that they could be involved in the training of the technical personnel. Lastly, the employers recommended that technical training curriculum should be reviewed regularly to meet the ever changing needs of the labour market due to the rapid technological changes taking place in the world.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter presents a summary of research findings, conclusions, recommendations of the study and suggestions for further research. The purpose of this study as indicated in chapter one was to investigate the relevance of knowledge and skills acquired by engineering graduates from the institutes of technology to the needs of the labour market.

The specific tasks of the study were to: examine the relevance of engineering curriculum to the needs of the labour market; identify the relevance of knowledge and skills acquired by engineering graduates from IT to the needs of the labour market; and, identify constraints faced by the IT in their efforts to prepare engineering trainees for the labour market.

#### 5.2 Summary of Research Findings

The first research question of this study set out to interrogate the relevance of Technical Education Programme (TEP) engineering curriculum to the needs of the labour market. Key findings indicated that, theoretically, TEP Curriculum was labour-market needs oriented. This was evident from the national aims and general objectives of TEP syllabus which made reference to preparing trainees with skills responsive to the labour market needs. The syllabuses reviewed (certificate in Carpentry and Joinery and diploma in Mechanical Engineering –Fabrication Technology and Metallurgy) laid emphasis on the intent to prepare graduates with practical skills and theoretical knowledge. The syllabuses indicated that the trainees were expected to acquire technical and problem-solving skills on which to build their analytical ability during the work experience. This is relevant to

the labour market needs because the employers indicated that practical skills, problem solving and diagnostic skills were key requirements in the labour market.

However, although there is link between the TEP curriculum and the labour requirements, the TEP curriculum was outdated as it was developed in the 1980s and 1990s and it had not been reviewed since then and hence the graduates are trained using outdated equipment as advocated in the TEP syllabuses. For instance, the mechanical and automotive students were trained using carburettor engines in accordance with the KIE TEP syllabi and Kenya National Examinations (KNEC) examination requirements. However, in the labour market, the latest models of motor vehicle engines were EFI and VVFI. In addition, the syllabi for engineering programmes did not have Information Communications Technology (ICT) component, forcing trainees to make their own arrangements on ICT training. The technology in place in these IT, in terms of machinery and equipment was obsolete and hence did not expose trainees and staff to ICT based equipment.

The second research objective of this study sought to establish the relevance of knowledge and skills acquired by engineering graduates from the Institutes of Technology to the needs of the labour market. The findings indicated that there was an education and training gap between the skills acquired in the IT and the skills required in the labour market except in acquisition of theoretical knowledge. There was an education/training gap in all cases. Education and training at the IT had not helped the graduates acquire as much knowledge/skills as they needed for their job performance.

The third research question sought to identify challenges faced by the IT in their effort to prepare the engineering trainees for the labour market. Some of the challenges included:

- Financial constraints
- Capacity and preparedness of lecturers to implement TEP curriculum
- Lack of adequate industrial attachment as a strategy to link training to labour market
- Lack of ICT skills
- Inadequate and out-dated facilities and equipment
- Students' inadequate knowledge background to undertake engineering courses

### **5.3 Conclusions**

The first research question sought to examine the relevance of Technical Education Programme (TEP) engineering curriculum to the needs of the labour market. From the findings it can be concluded that: Training in the Institutes of Technology (IT) is oriented to labour market industry needs. However, the main challenge was at the implementation level whereby the processes used in the learning were not effective. The facilities such as workshops were inadequate whereas, equipment and other machines were old, worn-out and outdated, and hence, they were an obstacle to effective learning outcomes. At the same time the lecturers also lacked adequate skills and experience due to limited exposure to technology in relevant industries and therefore they lacked the capacity to deliver relevant training. In addition, the TEP curriculum is outdated as it was developed in the 1980s and 1990s and had not been reviewed ever since and therefore it was not responsive to the labour market needs.

The second research question sought to establish the relevance of knowledge and skills acquired by engineering graduates from the Institutes of Technology to the needs of the labour market. From the findings it was concluded that there was a gap between the knowledge and skills acquired at the IT vis-à-vis those required in the labour market. The education and training imparted at the Institutes of Technology did not help the graduates to fully acquire the knowledge and skills required in the labour market.

The third research question sought to identify challenges facing the IT in their effort to prepare engineering trainees for the labour market. It was concluded that due to financial constraints facing the IT the current infrastructure and training resources in the four Institutes of Technology were not appropriate for the production of competent and innovative hands-on engineering graduates to spearhead Kenya's industrialisation process.

#### **5.4 Recommendations**

This section has been informed by the research findings as well as suggestions made by various respondents. A number of recommendations are therefore made as follows.

- i. Institutes of Technology in their capacities as the major suppliers of technically skilled personnel have to be sensitive to the labour market needs. This is more so today when contemporary challenges like globalisation and technological advancement are changing the labour market scenario. The Ministry of Higher Education should ensure that Institutes of Technology have modern machines and other equipment in line with current technology to enable them impart skills that are relevant to the needs of the labour market. Alternately, IT need to ensure that there

are arrangements for simulation exercises or to use facilities in the industries for training. In addition, IT need to provide opportunities for staff to gain exposure and experience in the use of new tools and equipment used in the workplace.

- ii. Kenya Institute of Education should incorporate ICT in the curriculum as a major component of IT education and training because it plays an important role in economic development.
- iii. Institutes Technology should develop stronger links with the industry. The institutions can benefit from the expertise available in industry and from exposure of students and instructors to the equipment and tools used in a modern work environment. Again, the programmes that are preparing persons for the workplace need to be demand-driven and developed in collaboration with the particular industries.
- iv. The Ministry of Higher Education should ensure that training in IT is based on courses where the concerned IT has a competitive edge. Instead of all the four IT offering the three engineering courses they can specialise, in such a way that each offers a course that it has the capacity to deliver quality education and training.
- v. Government budgetary allocation needs to be substantially increased while technical assistance and/or donor support from development partners towards technical education at all levels will be appreciated and encouraged. Specifically, more funds should be channeled to IT offering engineering courses to enable them establish specialized laboratories, upgrade their facilities and purchase modern equipment.

- vi. Teachers Service Commission (TSC), Ministry of Education and even individual colleges must make deliberate steps to ensure that lecturers receive relevant industrial exposure.

### **Suggestions for Further Research**

- (i) A similar study should be carried out in other segments of technical education and training because this study was on Institutes of Technology in the area of engineering.
- (ii) This study was only concerned with engineering graduates from Institutes of Technology working in formal employment. Another study could be done focusing on engineering graduates working in the informal sector or the self employed.
- (iii) This study only focused on engineering programmes, another study could be done in other programmes/disciplines that are offered in the same institutions.
- (iv) A replication of this study should be done to follow up on other engineering graduates from Institutes of Technology working out of the city of Nairobi.

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## APPENDICES

### Appendix 1

#### LETTER TO THE RESPONDENTS

Department of Educational Management,  
Policy and Curriculum Studies, Kenyatta  
University.

P.O Box 43844,

NAIROBI.

Dear Respondent,

**RE: A STUDY ON THE SKILLS TRAINING AND LABOUR MARKET  
REQUIREMENTS**

I am a postgraduate student in Kenyatta University pursuing a Doctor of Philosophy Degree in Education. I am currently conducting a research on the above topic and I wish to request you to fill in the attached questionnaire. Your honesty in responding to all the items in the questionnaire will be highly appreciated.

I assure you that the information you provide will be used for the purpose of the research only and that it will be held in strict confidence. Therefore, you need not write your name on the questionnaire.

Thank you in advance.

Yours faithfully,

Charity M. Limboro

## Appendix 2

### LECTURERS' INTERVIEW GUIDE ON SKILLS TRAINING AND LABOUR MARKET REQUIREMENTS

1. Gender: \_\_\_\_\_
2. Age: \_\_\_\_\_
3. Highest professional qualification: \_\_\_\_\_
4. How long have you been teaching in this institution?
5. What are your teaching subjects?
6. Comment on the relevance of Technical Education Programme (TEP) Curriculum to the needs of industry.
7. When was this curriculum developed?
8. What curriculum changes have taken place since this curriculum was put in place?
9. How do the lecturers incorporate curriculum changes?
10. What steps does this institution take to ensure that training is relevant to the requirements of the labour market?
11. How often do you go out for industrial exposure? In your opinion, do you have adequate industrial exposure? Please explain.
12. How is field attachment for the trainees managed? How are the students evaluated?
13. What are the specific skills that are taught to the learners in your area of specialization? In your opinion, to what extent are these skills relevant to the needs of the labour market?
14. To what extent does technical education and training as provided by this institution help the trainees acquire the theoretical knowledge and skills required in the labour market?
15. In your opinion, how would you rate the preparedness of engineering graduates from institutes of technology in your area in terms of knowledge and skills taught in relation to the labour market?
16. Generally, what constraints do you face in preparing students for the world of work?
17. What recommendations would you like to make in terms of what you think should be done to ensure that trainees in your area of specialization are adequately prepared for the world of work?

**Thank you for your cooperation.**

### Appendix 3

## INSTITUTES OF TECHNOLOGY GRADUATES' QUESTIONNAIRE ON SKILLS TRAINING AND LABOUR MARKET REQUIREMENTS

### INSTRUCTIONS

Fill in the blank where space is provided or tick [✓] against the right choice where options are given.

### PART: A

1. Indicate your gender:      Male [ ]      Female [ ]
  
2. Please indicate your age.
  - a) 20-25 years      [ ]
  - b) 26-31 years      [ ]
  - c) 32-37 years      [ ]
  - d) 38 and above      [ ]
  
- 3 Indicate your highest academic qualification.
  - a) KCSE      [ ]
  - b) KACE      [ ]
  - c) KCE      [ ]
  - d) Others (Specify) \_\_\_\_\_
  
4. Please write the name of the institution where you trained \_\_\_\_\_
  
5. When did you complete your training? \_\_\_\_\_
  
6. What is your highest professional qualification?
  - a) Certificate      [ ]
  - b) Diploma      [ ]
  - c) Higher Diploma      [ ]
  - d) Others (specify) \_\_\_\_\_
  
7. What is your occupation? \_\_\_\_\_
  
8. How long have you worked in this industry? \_\_\_\_\_
  
9. To what extent does your present job need the following skills? Please use the scale below to indicate your answer by circling the appropriate number in the table provided.

**Scale**

- To a low extent = 1  
 To some extent = 2  
 To great extent = 3  
 To a very great extent = 4

Items				
<b>Theoretical knowledge</b>				
1. about technical aspects of your job	1	2	3	4
2. about administrative techniques	1	2	3	4
3. about people and their motivation	1	2	3	4
4. about building effective teams	1	2	3	4
<b>Skills</b>				
5. of handling technical problems	1	2	3	4
6. of handling administrative problems	1	2	3	4
7. of motivating people	1	2	3	4
8. of building effective teams	1	2	3	4
9. of innovative thinking (e.g. developing new and applying new and better ways doing your job)	1	2	3	4

10. To what extent did technical training help you acquire the theoretical knowledge and skills needed for your job? Please use the following scale for answering by inserting the scale value in the appropriate space provided after each statement.

**Scale**

- To a low extent = 1  
 To some extent = 2  
 To great extent = 3  
 To a very great extent = 4

Items				
<b>Theoretical knowledge</b>				
1. about technical aspects of your job				
2. about administrative techniques				
3. about people and their motivation				
4. about building effective teams				
<b>Skills</b>				
5. of handling technical problems				
6. of handling administrative problems				
7. of motivating people				
8. of building effective teams				
9. of innovative thinking (e.g. developing new and/or applying new and better ways of doing your job)				

11. In your opinion, were you adequately trained with the theoretical knowledge and skills needed for job performance in your area of specialization? Please explain.

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12. What skills are exactly needed in your area of specialization? List them.

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13. Do you possess these skills?

a) Yes [ ]

b) No [ ]

14. If No in (13), above list the skills that you lack?

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15. Please list what you consider to be the strengths and weaknesses of the technical training you received.

Strengths	Weaknesses

**PART: B**

17. List the challenges that you encountered during training at the institutes of technology

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

18. What recommendations would you like to make in terms of what you think should be done to ensure that trainees in your area of specialization are adequately prepared for the world of work?

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**Thank you for your cooperation.**

## Appendix 4

### INSTITUTES OF TECHNOLOGY GRADUATES' INTERVIEW GUIDE ON SKILLS TRAINING AND LABOUR MARKET REQUIREMENTS

1. Gender: \_\_\_\_\_
2. Highest professional qualification. \_\_\_\_\_
3. Area of specialization: \_\_\_\_\_
4. What types of theoretical knowledge and skills are exactly needed in your area of specialization?
5. Do you possess these theoretical knowledge and skills? Please explain.
6. In your opinion, were you adequately trained with the theoretical knowledge and skills needed for job performance in your area of specialization? Please explain.
7. What skills do you lack?
8. What factors contributed to inadequate acquisition of knowledge and skills required in the labour market?
9. Please list what you consider to be the strengths and weaknesses of the technical training you received.
10. Please tell me about the challenges that you encountered during training at the institutes of technology
11. What recommendations would you like to make in terms of what you think should be done to ensure that trainees in your area of specialization are adequately prepared for the world of work?

**Thank you for your cooperation.**

## Appendix 5

### HEADS' OF DEPARTMENT INTERVIEW GUIDE ON SKILLS TRAINING AND LABOUR MARKET REQUIREMENTS

1. Name of the department: \_\_\_\_\_
2. Teaching subjects: \_\_\_\_\_
3. Gender: \_\_\_\_\_
4. Age: \_\_\_\_\_
5. What is your highest professional qualification? \_\_\_\_\_
6. How long have you been teaching in this institution as a Head of Department?
7. How many lecturers do you have in this department?
8. Do these lecturers meet the teaching needs of the department? Please Explain.
9. In your opinion, are the lecturers in your department adequately trained? Why do you say so?
10. How often do members of the academic staff go out for industrial exposure? In your opinion do the lecturers in your department have sufficient work experience in industry? Why do you say so?
11. How frequently are the members of staff in-serviced to acquaint them on how to teach new trades?
12. What are the specific skills that are taught to the learners in this department? In your opinion, to what extent are these skills relevant to the needs of the labour market?
13. Comment on the facilities in your department? Are they adequate? Explain the status of the training facilities and equipment.
14. To what extent does technical education and training as provided by your institution help the trainees acquire the theoretical knowledge, skills and attitudes required in the world of work?
15. Comment on the current TEP curriculum?
16. When was this curriculum developed?
17. What curriculum changes have taken place since this curriculum was put in place?
18. How do the lecturers incorporate curriculum changes? Please explain.

19. In your opinion, how would you rate the preparedness of the former Kenya Polytechnic graduates in terms of skills acquired in relation to the labour market requirements?
20. What challenges did you experience in your efforts in equipping trainees with the skills required in the world of work?
20. What recommendations would you like to make in terms of what you think should be done to ensure that trainees are adequately prepared for the world of work?

**Thank you for your cooperation.**

## Appendix 6

### SENIOR ASSISTANT DIRECTOR IN-CHARGE OF TECHNICAL EDUCATION PROGRAMME (TEP) AT THE KIE INTERVIEW GUIDE ON SKILLS TRAINING AND LABOUR MARKET REQUIREMENTS

1. Gender: \_\_\_\_\_
2. State your academic qualification: \_\_\_\_\_
3. State your professional qualification: \_\_\_\_\_
4. How long have you worked here in your current capacity?
5. Who determines curriculum for technical training institutions?
6. Explain the processes that are involved in designing TEP curriculum.
7. In designing TEP curriculum what steps are taken to ensure the needs of the labour market are catered for?
8. To what extent are the employers involved in curriculum design and review?  
Please explain.
9. How often is the TEP curriculum reviewed in order to incorporate the changes in society?
10. In your opinion do you think KIE has the capacity to design TEP curriculum?  
Why do you say so?
11. What do you consider to be strengths and weaknesses of TEP curriculum?
12. Please give your suggestions on what you think should be done to ensure that technical training is relevant to the needs of industry.

**Thank you for your cooperation**

## Appendix 7

### LECTURER IN-CHARGE OF INDUSTRIAL ATTACHMENT INTERVIEW GUIDE ON SKILLS TRAINING AND LABOUR MARKET REQUIREMENTS

1. Gender: \_\_\_\_\_
2. State your academic qualification: \_\_\_\_\_
3. State your professional qualification: \_\_\_\_\_
4. How long have you worked here in your current capacity? \_\_\_\_\_
5. What role does the college play in securing placement for trainees for industrial attachment?
6. Explain the importance of industrial attachment for the trainees.
7. How is field attachment for the trainees managed? How are the students evaluated?
8. In your opinion, how effective is industrial attachment?
9. What industries does this institution have linkages with? Explain the nature of the linkages.
10. Do you encounter any challenge(s) in regard to placing students for industrial attachment?
11. Generally, how can industrial attachment be made more effective?

**Thank you for your cooperation.**

## Appendix 8

### SUPERVISORS' INTERVIEW GUIDE ON SKILLS TRAINING AND LABOUR MARKET REQUIREMENTS

1. Name of the industry: \_\_\_\_\_
2. Gender: \_\_\_\_\_
3. What is your major source of personnel?
4. Tell me about the needs of the labour market
5. While selecting your personnel, what skills do you consider to be important?  
(probe on the reasons)
6. In your opinion, do institutes of technology graduates fresh from college possess the relevant skills that you require?
7. What would you say are some of the skills is required in your company that graduates from Institutes of Technology lack?
8. In your opinion, how well do you think these graduates were prepared for the labour market? (Probe for reasons)
9. How has your company changed over the last four years in terms of technology and size?
10. In your opinion, to what extent do you think the Technical Education curriculum has changed to incorporate the technological changes in your company?
11. Comment on the overall match between skills required by the employers and the skills brought to the labour market by the graduates from the Institutes of Technology.
12. To what extent does this company collaborate with training institutions?
13. Do you accept trainees for industrial attachment? If yes, are they assessed? Explain generally how the trainees are assisted to learn during this period.
14. In your opinion, do institutes of technology take industrial attachment seriously? Why do you say so?
15. To what extent are you satisfied with the performance of the graduates from the Institutes of Technology working in this company?
16. Any other comment on graduates from the institutes of technology?
17. Are you involved in designing or review of curriculum for technical training institutions? If so, explain the role that you play or the process you are involved in, and if not what contributions do you think you can make to improve training at the technical training institutions?
18. What do you consider to be the strengths and weaknesses of technical training at the Institutes of Technology?
19. Please give your suggestions on what you think should be done to ensure that technical training is relevant to the needs of industry.

**Thank you for your cooperation**

## Appendix 9

### FACILITIES AND EQUIPMENT OBSERVATION GUIDE

The observation will focus on the following aspects:

1. List the number of facilities
2. Describe the state of the facility, capacity and conditions

Institution	Classrooms		Labs		Workshops		Library		Staffroom/Offices	
	Nr	Cn	Nr	Cn	Nr	Cn	Nr	Cn	Nr	Cn

**KEY:**

**Nr-Number**

**Cn- General Condition of the facility**

3. List the number of equipments in the three departments
4. Describe the status of the equipment

Use the following terms: Good, Fair, and Poor

Equipment	Status		
	Obsolete	Working	Need repair

5. Maintenance of facilities and equipment (explain)
6. Adequacy of facilities and equipment (explain)

## Appendix 10

### DOCUMENT ANALYSIS GUIDE - TEP CURRICULUM

The analysis of TEP curriculum focused on two Syllabuses.

1. When were the syllabuses developed?
2. What is the link between national aims of TEP to needs of the labour market?
3. If the link is there, do the objectives of the TEP relate to needs of the labour market?
4. Are the syllabuses guided by those aims?
5. What conclusions can draw from the structures of the TEP syllabuses in relation to equipping the graduates with relevant knowledge and skills required in the labour market?
6. How are the trainees assessed? What lessons can be drawn from assessment?
7. Is the content taught at the IT relevant to the needs of the labour market?

### Document analysis guide Education reports and Economic surveys

#### Various Education reports will be examined to find out:

1. to what extent some of the following major themes were to be found in the education commissions, and Sessional papers that were related to education, employment and the wider economy
2. Policy views about the link between education & skills development and economic growth;
- ✓ 3. Policy perceptions of the connections between education & skills development and poverty reduction;
4. Concerns about the quality and learning outcomes of education and training systems;

#### Economic Surveys

Economic Surveys from 2004-2009 will be examined to find out government's funds allocation to TVET

## Appendix 11

### A SUMMARY OF CAPENTRY AND JOINERY COURSE TIME ALLOCATION

#### FIRST YEAR TRADE THEORY

79 HOURS

TOPIC	SUB-TOPIC	TIME(HRS)
7.1.T INTRODUCTION	History of Carpentry & Joinery Difference between Carpentry & Joinery Organisation of the Carpentry and Joinery workshop	1
8.1.T SAFETY	Accidents Behaviour and dressing Workshop cleanliness and organisation Fire Extinguishers First Aid Factorise Act	2
9.1.T MATERIALS	Tree growth and uses Felling and transportation Conversion Market sizes Seasoning Deffects	16
10.1.T HAND TOOLS	Marking out Measuring and testing Driving Boring Cutting Planing and shaping Setting out	10
11.1.T PREPARATION OF MATERIALS	Cutting list format Setting out rods	10

TOPIC	SUB-TOPIC	TIME (HRS)
12.1.T ASSEMBLY	Joints Fasteners Adhesives Holding devices	18
13.1.T FINISHINGS	Reasons for Applying Finishings Materials Equipment Finishing materials Care and maintenance of equipment Care of finishings and finishing materials	6
14.1.T HARDWARE	Identification Classification	6
15.1.T.2 BATTENED DOORS	<ul style="list-style-type: none"> <li>- Sketching door frames and door linings</li> <li>- Uses of door frames and linings</li> <li>- Fixing methods</li> <li>- Selection</li> <li>- Criteria</li> <li>- Fixing devices</li> </ul>	5
15.1.T.2 BATTENED DOORS	<ul style="list-style-type: none"> <li>- Sketching different types</li> <li>- Uses and advantages</li> <li>- Selection criteria</li> <li>- Appropriate Iron-Mongery</li> </ul>	5

SECOND YEAR TRADE THEORY

79 HOURS

TOPIC	SUB-TOPIC	TIME
8.2.T SAFETY	Behaviour and dressing Fire control First aid	2
9.2.T MATERIAL	Seasoning of timber Defects due to seasoning Preservation of timber Manufactured boards Storage of materials Wet and dry rot Prevention of fungal attack Insects that attack timber Prevention of insect attack Treatment of timber attacked by insects	8
10.2.T HAND TOOLS	Tools Care and maintenance of tools	3
12.2.T ASSEMBLY	Joints Adhesives	2
13.2.T FINISHINGS	Fixing devices Types of fixings First and Second fixings Methods of fitting and fixing	2
15.2.T DOORS	Sketching and labelling Uses and advantages Criteria for selecting materials Criteria for selecting hardware Criteria for choosing surface finishing	10

TOPIC	SUB-TOPIC	TIME	
16.2.T	WINDOWS	Functions Sketching Selecting	
17.2.T	SUSPENDED TIMBER FLOORS	Functions Sketching Materials	
18.2.T	ROOFS	Types of roofs Functional requirements Roof coverings	8
19.2.T	TIMBER STAIRS	Materials Functional requirements Sketching Kenya Building Code Selecting timber	
20.2.T	TEMPORARY	Uses Sketching Regulations Safety precautions Materials	10
21.2.T	SITE WORKS	Materials for fences Treating timber against insect attack Sketching gates Selecting gates	2
22.2.T	TIMBER BUILDINGS	Materials Construction	8
23.2.T	OCCUPATIONAL INFORMATION	Job opportunities Further training programmes Relationship between Carpenter and Joiner and other related tradesmen in the construction industry	2

TRADE PRACTICE

713 HOURS

1ST YEAR

TOPICS	SUB-TOPICS	TIME
8.1.P SAFETY	Behaviour and dressing Tools safety First Aid	11
9.1.P MATERIALS	Identifying timber Selecting timber	22
10.1.P TOOLS	Selecting tools Using tools	60
11.1.P PREPARATION OF MATERIALS	Preparing cutting list format Entering materials in the format Truing up stock Making setting out rods	80
12.1.P ASSEMBLY	Making joint Fastening Applying adhesive using holding devices	90
13.1.P FINISHINGS	Preparing surfaces Applying finishes Care and maintenance Protection of finishings	50
15.1.P DOORS	Making frames and linings Fixing frames and linings Making battened doors Hanging battened doors	160
24.1.P FURNITURE	Making a bench trestle Making a stool Making a table Making a cupboard Making table chairs	240

1ST YEAR

8.1.P SAFETY - 11 HOURS

8.1.PI Specific Objectives

At the end of this topic, the trainee should be able to:

- a) wear appropriate working clothing
- b) demonstrate first aid in the workshop

8.1.P11 Behaviour and dressing

8.1.P12 Tools safety

8.1.P13 First aid

- i) cuts and bleeding
- ii) loss of life
- iii) shock treatment

9.1.P MATERIALS - 22 HOURS

9.1.PI Specific Objectives

At the end of this topic, the trainee should be able to:

- a) identify common types of timber used in Kenya
- b) select timber for a given task
- c) stack pieces of timber for seasoning

9.1.P11 Identifying timber

- i) hardwood
- ii) soft wood

TRADE PRACTICE

713 HOURS

2ND YEAR

TOPICS	SUB-TOPICS	TIME
8.2.P SAFETY	Behaviour and dressing Fire precautions	13
9.2.P MATERIALS	Preservation Manufactured boards Storage	20
10.2.P1 TOOLS: HAND TOOLS HAND POWERED TOOLS	Boring tools Cutting tools Planing and shaping tools Setting out tools	20
10.2.P2 PORTABLE POWER TOOLS	Planing Boring Cutting Sanding Shaping Spraying	40
12.2.P ASSEMBLY	Making joints Fastening Applying adhesives Using fixing devices	70
13.2.P FINISHINGS	Preparing surfaces Fitting plastic laminates	70
15.2.P DOORS	Making panel doors Hanging panel and flush doors Fitting hardware to doors	140

TOPICS	SUB-TOPICS	TIME
16.2.P WINDOWS	Making window frames and windows Fitting windows and window frames Fitting hardware for windows	80
17.2.P SUSPENDED TIMBER FLOORS	Constructing timber floors Applying preservatives	30
18.2.P ROOFS	Constructing and erecting roofs Covering roofs Fixing ceilings	90
19.2.P TIMBER STAIRS	Constructing and erecting stairs Finishing stairs	30
20.2.P TEMPORARY WORKS	Hoarding Scaffolding Formwork Centering Timbering to shallow trenches	60
21.2.P SITEWORKS	Fencing Gating	20
22.2.P TIMBER BUILDING	Constructing frame panels Erecting frame panels Fixing roofs Fixing ceilings Fixing doors and windows Finishing	50

Appendix 12

RESEARCH PERMIT

PAGE 2

PAGE 3

THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss..... CHARITY  
M. LIMBORO

of (Address) KENYATTA UNIVERSITY  
PO BOX 43844 NAIROBI

has been permitted to conduct research in.....  
TECHNICAL TRAINING INSTITUTES

..... Location,  
ALL District,

..... ALL Province,

on the topic SKILLS TRAINING AND  
LABOUR MARKET REQUIREMENTS: A  
CASE OF TECHNOLOGY, KENYA

for a period ending 30TH OCTOBER 20 10

NCST/5/002/R/978

Research Permit No. ....

Date of issue 21.10.2009

Fee received SHS 2000



*Charity M. Limboro*  
Applicant's  
Signature

*[Signature]*  
Secretary  
National Council for  
Science and Technology

CONDITIONS

1. You must report to the District Commissioner and the District Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
2. Government Officers will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2)/four(4) bound copies of your final report for Kenyans and non-Kenyans respectively.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice



REPUBLIC OF KENYA

RESEARCH CLEARANCE PERMIT

GPK 6055-3m-10/2009

(CONDITIONS—see back page)

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