JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Vocational Education Reform in Ethiopia: Implications of Intelligent Manufacturing and Global Policy

Authors - Muleta Ashenafi Edae[1] Guohe Li [1] Wen Ping Zhao[2]

[1]School of Mechanical Engineering, Tianjin University of Technology and Education, Tianjin, China

[2]School of Vocational Education, Tianjin University of Technology, and Education, Tianjin, China

Tianjin University of Technology and Education, Tianjin 300222, China
Mechanical Engineering Department
Specialization： Machine Design and Automation Education

Email: asheda2024@gmail.com

Abstract

The purpose of this study is to assess Ethiopia's technical and vocational education and training (TVET) policy and strategy's successes and shortcomings. It makes suggestions for enhancements to support long-term solutions to young unemployment, a critical national issue, and assists top management in making well-informed decisions. Two million graduates would be looking for work, according to a World Bank report released on January 31, 2024, which increased pressure on the government to handle the rising need for jobs. In order to address current issues, the report promotes a tailored TVET strategy that takes into account Ethiopia's requirements and best practices. The employment rate of vocational graduates has not improved despite the country's significant economic expansion, indicating a discrepancy between the skills provided in TVET institutes and the needs of employers. TVET in Ethiopia needs to adapt to the evolving global landscape to address these challenges. The newly established Ministry of Labor and Skills (MOLS) aims to mitigate the adverse effects of major technological and economic shifts. Its goal is to create a skilled workforce capable of meeting the demands of modern industries, thus driving job creation and supporting the country's progress in the era of Industry 4.0and 5.0 features prospects of citizen well-being and prosperity. This strategic shift is key to ensuring that Ethiopia can remain competitive and prosperous in the changing global economy.

To help the Ministry of Labor and Skills (MOLS) restructure the TVET system and adopt new tactics, the study also looks at secondary data and literature. In order to comprehend current knowledge on the topic and provide policy recommendations for the ministry, the research technique consists of a review of the literature, secondary data analysis, and observations.

Keywords: TVET reform, foreign policy, intelligent manufacturing, youth unemployment.

1. Introduction

In Ethiopia, as in many other parts of the world, vocational education prior to the creation of the current educational and training system concentrated on preparing people for careers in crafts like weaving, metalworking, woodworking, leatherworking, cooking, aesthetics, art, music, and architecture. Communities passed down these ancient talents from one generation to the next. Despite the lengthy history of technical and vocational education and training (TVET) in Ethiopia, handicrafting and associated occupations have been stigmatized by society. The development of indigenous professions and technical innovation has been impeded by a social attitude that addresses the sector's ongoing challenges and ensures its continued contribution to national development by satisfying the expectations of the labor market for competence; the TVET system must provide a trained and driven workforce that can support economic growth and development.

A strong and clear TVET policy is necessary to meet national development goals. To guarantee quality and relevance, this involves putting in place occupational standards and an outcome-based curriculum. The industry has not quite achieved its goals despite attempts to enhance TVET, particularly with regard to growing TVET institutions. Employers have voiced their displeasure with TVET graduates' lack of practical skills, pointing to a discrepancy between educational objectives and industry demands. To address the sector's ongoing challenges, the newly created education and training roadmap recommends a critical evaluation of the current TVET plan and its implementation, in addition to other pertinent studies [1]

Human resource development is essential in today's globalized world if nations are to eradicate poverty, advance, raise living standards, and remain competitive internationally. However, technical and vocational education and training (TVET) systems are insufficient in many low- and middle-income nations. The labor market's changing skill requirements and the growing need for skilled workers are not met by these systems. Many nations lack efficient TVET systems that may close this gap, especially in light of globalization, technological advances, demographic shifts, and climatic issues, according to a joint assessment conducted by UNESCO, the World Bank, and the ILO in 2023. [2]. TVET needs to adjust to the shifting global environment in order to handle these problems. The newly formed Ministry of Labor and Skills (MOLS) in Ethiopia seeks to alleviate the adverse impacts of significant technical and economic changes. By creating a trained workforce that can satisfy the demands of contemporary businesses, it seeks to promote job creation and help the nation attain prosperity in the age of Industry 4.0.

According to [3] TVET systems worldwide can be categorized into three main models that reflect the European experience: the UK liberal market model, the French state-regulated bureaucratic model, and the German dual system model. Each model has its own structure and approach to vocational education and training. Liberal Market Economy Model (UK, Australia), in this model, TVET is driven by the private market, where industries and firms decide the skills needed for the workforce. Industry sector skills councils determine the qualifications required, and private companies voluntarily fund workers' training and apprenticeships. This is often referred to as the voluntary model, with industry and firms covering the majority of costs, while the government funds research into industry skill gaps and subsidizes at-risk trainees. French State-Regulated Bureaucratic Model, in contrast, this model is heavily regulated by the state. The government plays a central role in organizing, funding, and overseeing vocational training programs, ensuring that there is alignment with national economic goals and policies. The state manages the allocation of funds and qualifications, and employers are required to contribute to training costs. The German dual system model, model is a combination of theoretical education and practical on-the-job training. It emphasizes close cooperation between vocational schools and businesses, with a strong focus on apprenticeships. The government, employers, and employees share the responsibility for funding training, and the system provides a clear path for skills development, ensuring that there is strong alignment between education and labor market needs.

International representations of TVET training come in three forms: The liberal free market model from Britain. The German binary model and the French state-led bureaucratic model, the provision of TVET in England's liberal free market model is based on industry demand. This model, known as the voluntary model, is named such because industry and private organizations willingly pay for the trainees' expenses. Industry sector skills committees make the decisions about vocational skills. While private firms and the industry in this arrangement

pay for trainees, it is a system where the government pays for research on industry skill gaps and at-risk trainee costs.

In this model, there is a strong cooperation between the government and the private sector, and the industry covers the cost of the apprenticeship training, while the government covers the cost of the training provided by the TVET institutions [4]

Among the three models put forth, the binary model is the one that is most liked since it allows trainees to gain theoretical knowledge from TVET institutions and apply it in the workplace, as well as because it fosters an environment that is conducive to the integration of theory and practice. It is thought that developing their people resources via education and training is how today's technologically and economically advanced nations got to this stage. The human resources needed by today's industries (Industry 4.0) must possess 21st-century skills, such as media and technology skills, learning and innovation skills, and life and career skills. Thus, education and training must prioritize 21st-century skills if TVET is to provide relevant and high-quality skilled labor for the industry [5]

Objective of the Study

This research was designed to achieve the following goals:

- ✓ To review major TVET policy reforms in developed and developing countries of the world
- ✓ To assess the policy and strategy's implementation strengths and weaknesses
- ✓ Dissemination of the new vocational education reform policy lessons, for the Ethiopian context, for sustainable industrial growth
- ✓ Adopting tailored(customized) international best practices on topics selected as important in the field of technical and vocational training

2. Methods

The methodology used demanded a thorough examination and analysis of the literature in order to pinpoint important aspects of material evaluation while taking into account the quantity of information already available on the topic. As part of this strategy, both paper and electronic documents were evaluated methodically. Document analysis, field trips, and participant observation during project activities were also essential components of the procedure. The successes, shortcomings of Ethiopia's prior Technical, Vocational Education, and Training (TVET) policy model were critically assessed in order to facilitate the execution and improvement of the policy reform agenda. Finding important insights and promoting a better

3. Result and Discussion

3.1. Reviewing recent changes to the Ethiopian TVET policy and adopt foreign policy

Facts and Scientific Aspects

Ethiopia's Technical and Vocational Education and Training (TVET) system has to be reformed in view of the country's fast-changing workplace and changing skill requirements brought on by the digital revolution. Since traditional TVET systems that consider formal education to be final would not equip workers for the dynamic, tech-driven labor market, lifelong learning and continuous skill development are essential in this setting. Other nations' experiences indicate that TVET models should not be completely replicated without being modified for the local environment. Governments should instead design their own customized models, combining effective tactics, benchmarking, and experimentation to establish a system that works for their unique political, economic, and cultural contexts. This strategy is thought to be more successful in guaranteeing that TVET satisfies regional demands and promotes sustained workforce development.

Foreign Policy Perspective of TVET Reform

Before proposing a training model that is suitable for TVET in Ethiopia and takes into account the economic and political situation of our country, it needs to see the training models of other countries, so it checked the world-renowned models of France, England, Germany, China, and South Asian countries.

Several nations' experiences demonstrate that TVET training approaches will not work if governments simply adopt them without first ensuring they fit their own local context. The degree to which companies invest in training sets one country's training model apart from another, and the degree of government support for training is the second indicator. Three categories emerge from the inspection of technical and vocational education and training models based on these criteria. These models of dual vocational training are sentimentalist, liberal, and dual.

The bureaucratic, government-controlled TVET training paradigm is one of the most commonly used models worldwide. The government's significant commitment to promote vocational education sets this approach apart from others. This means that the training model is one in which the government plays a major role in the development of standardized institutions and training levels, while businesses and industries play a minor and consultative role in vocational training. Among the nations that use this kind of training methodology is France.

The second kind of training model is the liberal skills training model, in which "training" is frequently given on the job using a firm-specific training model. According to this model, the government's primary duty is to guarantee that all information regarding industry demands is available and to disseminate this information to the education and training system, as well as job seekers in the United Kingdom or England. Significant employer and government involvement distinguish the third type, known as the collaborative skills training model, particularly by the government's dedication to supporting vocational education. According to this paradigm, the government is in charge of developing training at all levels, keeping an eye on its efficacy, and stepping up collaboration with employer associations. According to this approach, collaboration and partnership between the public and private sectors, that is, employers and unions, ensure not only that businesses can take part in vocational training but also that they can implement human resource development in a way that best suits their needs. One example of this type of training model is the German dual training approach. [6]

Domestic Approach

The 2001 TVET strategic plan and the 2016 TVET policy were thoroughly examined as part of the assessment of Ethiopia's Technical and Vocational Education and Training (TVET) system. Reports from regional TVET bureaus and the sector performance report from the Federal TVET Agency were also examined. Research papers from TVET institutes across the globe were also examined, with an emphasis on countries with robust and advanced TVET systems, including the Philippines, South Korea, China, Singapore, Australia, and Germany.

Using international benchmarking techniques from two chosen nations, the study also examined the advantages and disadvantages of the respective TVET systems. In order to improve Ethiopia's own TVET policies and procedures, this analysis sought to identify best practices, common challenges, and reform concerns. The TVET strategic plan (2001) and Ethiopian TVET policy (2016) have both undergone extensive reviews. The Federal TVET Agency's TVET sector performance report, as well as those from a few regional TVET bureaus, was examined. Research articles published on a few TVET institutes across several nations were examined. [7]

This suggests that the issues that need to be resolved initially should be looked at, and the industry is not equipped to lead TVET training. A number of changes have been made to Ethiopia's technical and vocational education and training (TVET) system with the goal of establishing guidelines for policies and procedures. The 2020 Technical and Vocational Education and Training Strategy and Policy are the most recent developments.

Ethiopia's national development policies, as well as the plans and goals for the education sector, have continuously mirrored this governmental intention. Additionally, it benefits companies by guaranteeing that their personnel are skilled and capable of meeting industry needs. Because TVET programs are usually shorter than

traditional academic degrees and give students real-world skills that they may use right away in the industry, they are also more affordable. The difficulty lies in the requirement for modern facilities and equipment. TVET programs need to stay up to date with the newest developments in technology as it continues to advance in order to give students the most relevant and practical training [8].

Adopting New Reform Direction and Suggestions

In some countries, employer-led sector skills councils play a key role in identifying skills needed in the labor market. However, it is difficult to create an organization capable of doing such work in countries where industrialization is at an early stage. One of the reasons for this is that in countries where industry is not sufficiently developed, most of the work is easy, and industrial establishments can be staffed by low-skilled people at low wages, so they do not pay much attention to the long-term career development system. As a result, it is difficult to build a TVET training system by reducing the share of the government and leading the industry. From the perspective of the actual situation, since Ethiopia is a nation with limited industrial development, the training model that should be adhered to is not entirely derived from the models of other nations. Instead, sectoral skill councils, professional associations, or other training institutions represent industry until it reaches the necessary level. This integrated training model places a strong emphasis on the government's involvement in organizing and directing these initiatives.

3.2. Quality and Relevance of Technical and Vocational Training

3.2.1. Technical and Vocational Training Qualification Framework (NTQF) and Pathway

Facts and Scientific Aspects

The Technical and Vocational Training Qualification Framework (NTQF) is a standard that can be applied to equal evaluation, recognize a profession acquired through other means, or give training by preparing qualifications. [9]A qualifications framework serves as a mechanism for classifying qualifications according to a hierarchy of levels of complexity and, in many cases; it includes a volume of learning measures.

The scope of frameworks may be inclusive and comprehensive (all levels and sub-sectors of qualifications, learning outcomes and pathways) or may be limited to specific sectors of education (e.g., technical and vocational education and training (TVET), known as sectoral qualifications frameworks.

Over the last four decades, qualifications frameworks have also been developed at sectoral levels, sometimes within a country, and in other cases between countries, but limited to one sector, and at transnational levels. However, the most frequent cases were observed at the national and regional levels. It lays the groundwork for enhancing connectivity, promoting lifelong learning, and fostering public or labor market recognition at the national and international levels. The Competency Framework includes a Training Pathway to bring consistency and simplicity. It also targets and distributes training opportunities more effectively, increases participation, and improves access to all qualification frameworks. Thus, a Technical and Vocational Training Qualification Framework (NTQF) is required in order to sustain the quality of training and make it globally competitive. It must offer reliable chances for lifelong learning or training.

Foreign Policy Perspective

The International Classification of Education (ISCED) indicates that there are nine levels of education and occupations (from zero to level 8) used by most countries in the world, in which general education and technical and vocational training are ranked from bottom to top [10].

Many policymakers and educators have acknowledged that promoting vocational education and training (VET) could be a crucial policy measure for developing countries to increase the number of skilled labor forces and

reduce youth unemployment [11]. The International Classification of Education (ISCED) indicates that there are nine levels of education and occupations (from zero to level 8) used by most countries in the world.

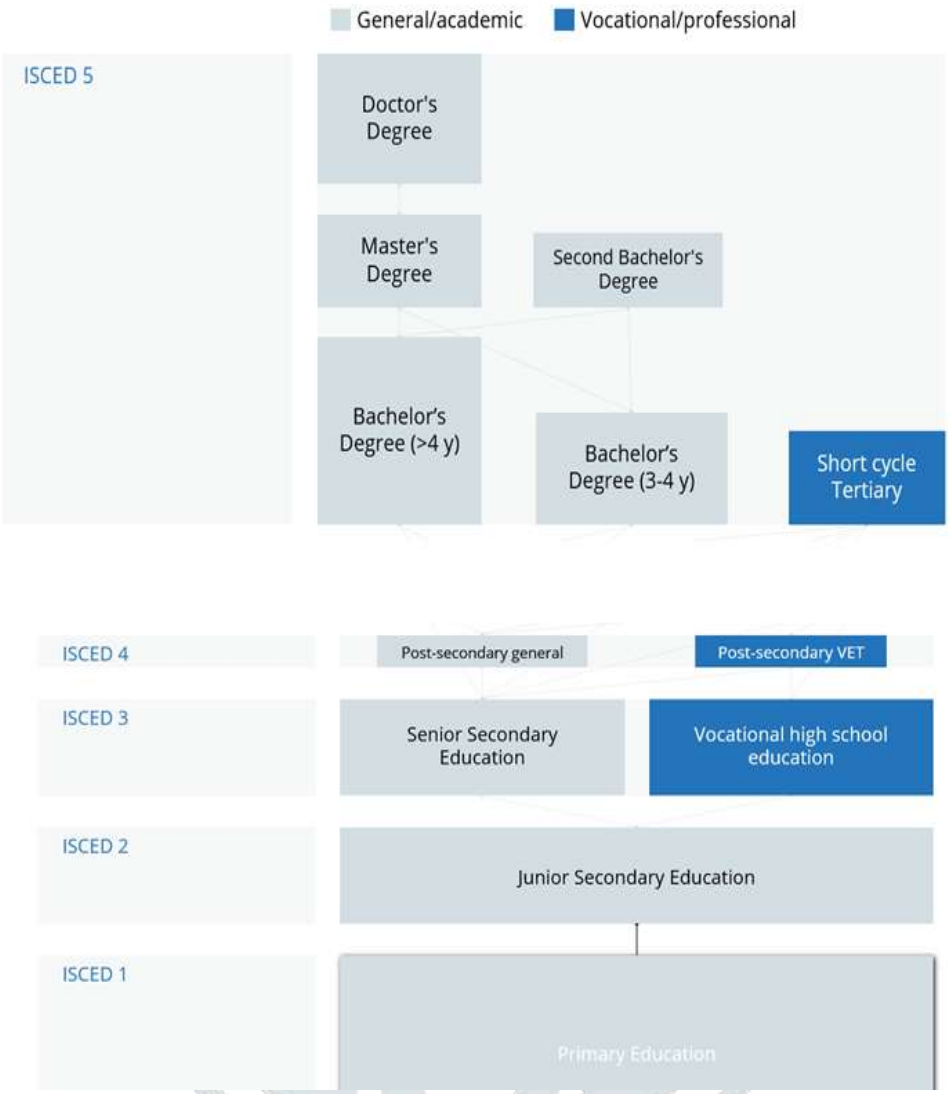


Figure 1 Image source: Formal Education System Diagram based on UNESCO Institute for Statistics, ISCED 2011 mapping China (school year reference: 2019)

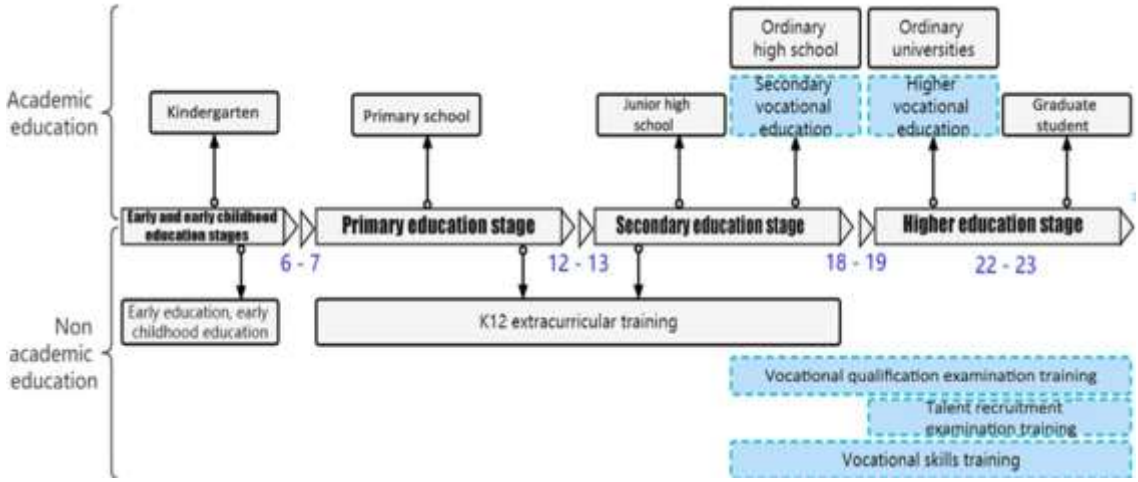


Figure 2 . China's educational system (Yinghui Fan et al., 2024)

A vocational education system in china where both academics education and non-academics vocational training coexist,in recent years, China's vocational education has undergone a series of educational system reforms, from the initial stage of development to a rapid growth stage and from a deepening reform stage to a development and improvement stage, achieving significant progress. Through research, learning, and a deep understanding of the current situation, future development trends, and pressing issues of China's vocational and technical education and training (TVET), insights have been proposed to accelerate the system framework construction of TVET, enhance and consolidate the social status and influence of vocational education, and expand its attractiveness among the people. This has profound significance for the development of vocational education in China. [12]
The diagram below indicates that the Philippine Technical and Vocational Education and Training Qualification Framework are providing training from National Certificate 1 to National Certificate 5. Vocational and technical training programs start from the upper secondary level of education, and upon completion of the set vocational level, trainees will receive National Certificate (NC) 1 and 2 recognition. After successful completion of upper secondary education, it provides the opportunity to complete Level 3 to Level 5 Diploma in Technical, Vocational Education, and Training, with lifelong learning opportunities leading to higher education up to a doctoral degree [13]

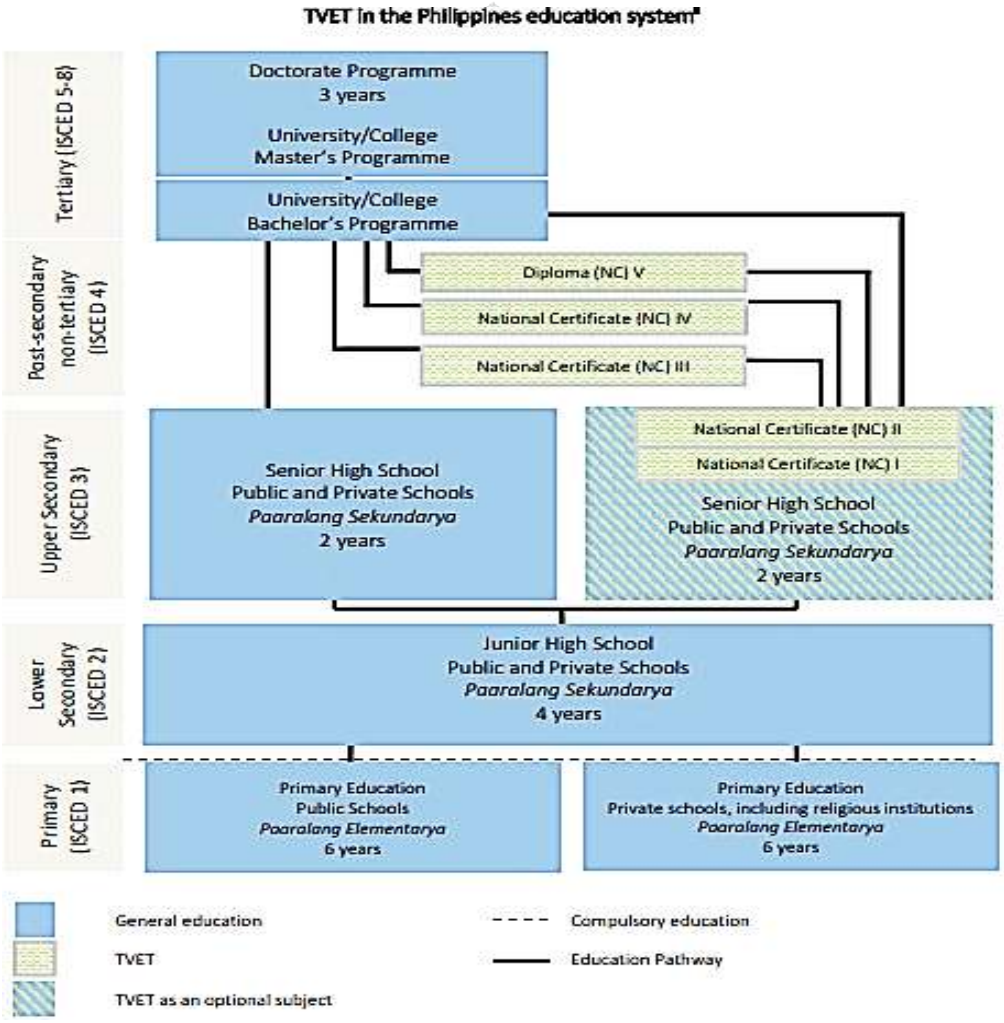


Figure 3 Philippine Vocational Training Ladder (Source: International Philippines Data 2019)

In the same way, Technical and vocational education and training (TVET) in Australia is known as vocational education and training (VET). It is a form of post-compulsory education and training, excluding degree and higher-level programmes delivered by further education institutions, which provides people with occupational or work-related knowledge and skills. VET covers a wide range of careers and industries, including trade and office work, retail, hospitality and technology. Among economically developed countries, Australia's technical and vocational education and training continues up to level 8. It has a qualification framework based on the experience of many countries in the world, and technical and vocational training begins after citizens complete

their primary education. Citizens who are interested in technical and vocational training have the opportunity to be trained from certificate 1 to level 8 or doctorate degree. Contrarily, the graphic description below indicates that citizens who have completed their primary education have a convenient and standardized qualification framework and a transition ladder that allows them to access a middle school and higher education training at all levels and to go to technical and vocational training at any level. [14].

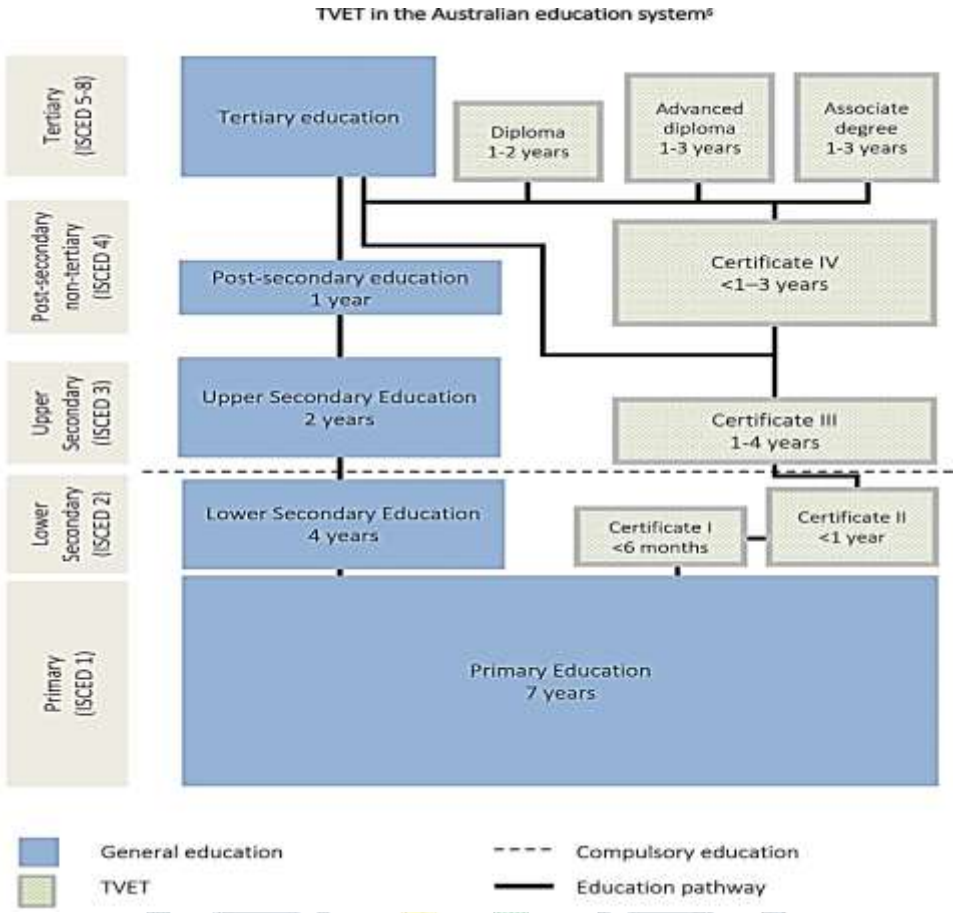


Figure 4 Australia's Technical and Vocational Training Ladder (Source: International Australia Database 2018)

Generally, Architecture of NQFs The level structure of NQFs varies, depending on its scope and the underlying education system. The Scottish NQF has 12 levels, while those in Ireland and Slovenia have 10 levels, but the majority of NQFs in Europe have a structure at eight levels. On the African continent, the majority of operational NQFs have 10 levels (Southern and East Africa), while in West Africa there are 8-level NQFs. The Australian NQF, one of the oldest, has been reviewed and restructured from 1 to 8 levels. [15]

Domestic Approach

Ethiopia offers training that is focused on results, as stated by UNESCO in 2020. With assistance from nations including Germany, Singapore, China, Japan, Australia, Cuba, Korea, and Italy, it has been offering five-level technical and vocational training since the 2000s. It has three modalities to accommodate different interest groups, which are formal, non-formal and informal. Formal trainees join TVET after completing a minimum of grade 10. Outcome based training curricula are developed by Polytechnic Colleges in association with regional TVET Agencies and enterprises. In the Ethiopian system, TVET strategy stipulates that 70% of the training should consist of workplace experience and only 30% of school-based education. Cooperative Training (CT) is a new system that is being tried but has not gained traction overall. It is based on what is called the 'German Model', a dual education and training system. However, the Technical and Vocational Training Qualification Framework differs from general education and technical and vocational education in that it seeks to supply middle-level skilled personnel from level 1 to level 5 to the national labor market. [16]

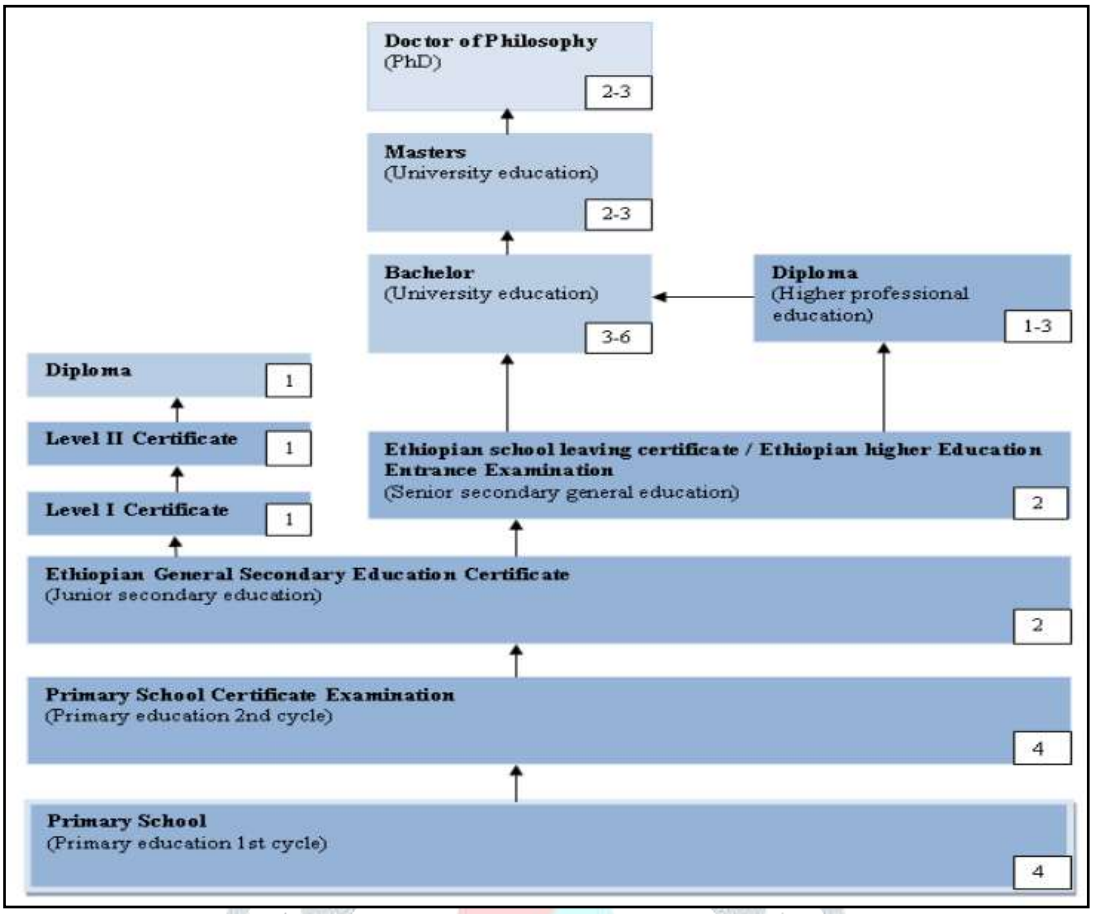


Figure 5 Ethiopian National Qualification Framework (Source: KV, James 2020, 12).

Reform Adopting Direction and Suggestion

The establishment of an entity tasked with coordinating, planning, and overseeing the national technical and vocational training competency framework; creating a national competency framework up to level 8, taking into account Ethiopia's development trajectory and emphasizing vocational careers Raising awareness and disseminating information are necessary to make sure that all stakeholders understand the competency framework. This includes the cultivation pyramid, lateral transfers of higher education, TVET training, general education, and proportional measurement at each level with the classification of regional and international education standards and read with the UN.

Additionally, a training system that fosters lifelong learning and can adapt to changing circumstances must be established. By incorporating the vertical and lateral share of the skills that trainees have gained through official and informal training, may create an environment that supports their growth.

Domestic Approach

The technical and vocational training system in Ethiopia, particularly when it comes to the implementation of result-oriented training, makes it very clear in its system documents that the needs of the customer serve as both the training's starting point and its endpoint. The government, business community, and industry are the sector's customers, and these groups in particular have worked very hard to meet their labor market needs in order to prepare themselves for professional level work. Additionally, considerable effort has been done to supply the business with the necessary human resources by creating more than 600 professional standards. The professional industry operates without ownership engagement while failing to modernize its standards to meet labor market changes and neglecting technological progress and flexibility.

Reform Adopting Direction and Suggestion

In order to achieve the desired national results in the industry, vocational level preparation is a crucial tool. If an organization is established that sufficiently incorporates the industry, employers' associations, professional associations, and highly experienced professionals, it can be prepared with particular attention. In light of the constantly changing labor market and technological advancements, it is important to maintain a regular schedule for updating professional standards' and preparing new ones. Before professional standards are put into use, they are reviewed or prepared in a new way, giving many opportunities for discussion and the creation of an environment that will help them grow with suggestions.

3.3. Preparation of curriculum

Facts and scientific Aspect

The curriculum is prepared by reading the knowledge, skills, and attitudes set in the curriculum on professional levels and training and learning tools; it is one of the first assignments for anyone working in the field. Curriculum, training, and learning tools are among the main tools to maintain the quality of technical and vocational training. Its main goal is to impart to students useful knowledge and skills. This kind of curriculum is made to get pupils ready for particular sectors and jobs. Usually, it consists of both practical training and classroom education. There are different names given to 21st Century skills such as employability skills, basic skills, life skills, transferable skills, soft skills, and core skills etc. These are divided into three categories:

1. Learning Skills– these skills teach students about the mental processes required to adapt and improve upon a modern work environment

2. Literacy Skills (IMT) – these skills focus on how students can discern facts, publishing outlets, and the technology behind them. There's a strong focus on determining trustworthy sources and information to separate it from the misinformation that floods the Internet.

3. Life Skills (FLIPS) – these skills look at intangible elements of a student's everyday life. These intangibles focus on both personal and professional qualities.

These skills are intended to help students keep up with the lightning-pace of today's modern markets. Each skill is unique in how it helps students, but they all have one quality in common. The Figure 1 below captures the skills in each category of learning, literacy, and life skills. [17]

Foreign Policy Perspective

The curriculum reform could come from different sources according to the situation in each country. On one hand, the need for updating content to fit evolving social, cultural, and economic contextual factors, has been an important driver in OECD countries (section: A global trend towards competence-centered curriculum). This future oriented approach aims at adapting academic requirements and envisioning what a student should acquire through the educational system to thrive in a 21st century society. For instance, the most recent curriculum reform document in New Zealand states its vision as cultivating "young people who will be confident, connected, actively involved, and lifelong learners" (The New Zealand Curriculum, 2007). International experience demonstrates that the creation of the curriculum, which serves as the primary foundation for the quality of training, should be qualitatively developed in connection to the professional level in order to give results-based training.

Domestic Approach

Ethiopia's TVET curriculum creation method is comparable to other nations' competency-based TVET curriculum development processes. TVET curricula from countries like Australia and the Philippines are primarily adopted by Ethiopia. According to the trends of these countries, Ethiopia's new TVET plan has decentralized curriculum material development to training facility staff. Perhaps the problem restricting Ethiopia's current competency-based TVET curriculum is a lack of knowledge and experience to develop the curriculum locally in this decentralized responsibility to construct the curriculum at TVET institutions. The administration is certain that the TVET reform plan will be able to turn the labor surplus into benefits that will

lead to prosperity TVET curriculum modification to meet the requirements of eight distinct economic zones and setting priorities

The Ethiopian TVET reform strategy includes initiatives such as tailoring the TVET curriculum to the demands of eight distinct economic areas and giving the five main sectors (agricultural, manufacturing, industry and mining, tourism, and ICT) priority in terms of skill development. [17]

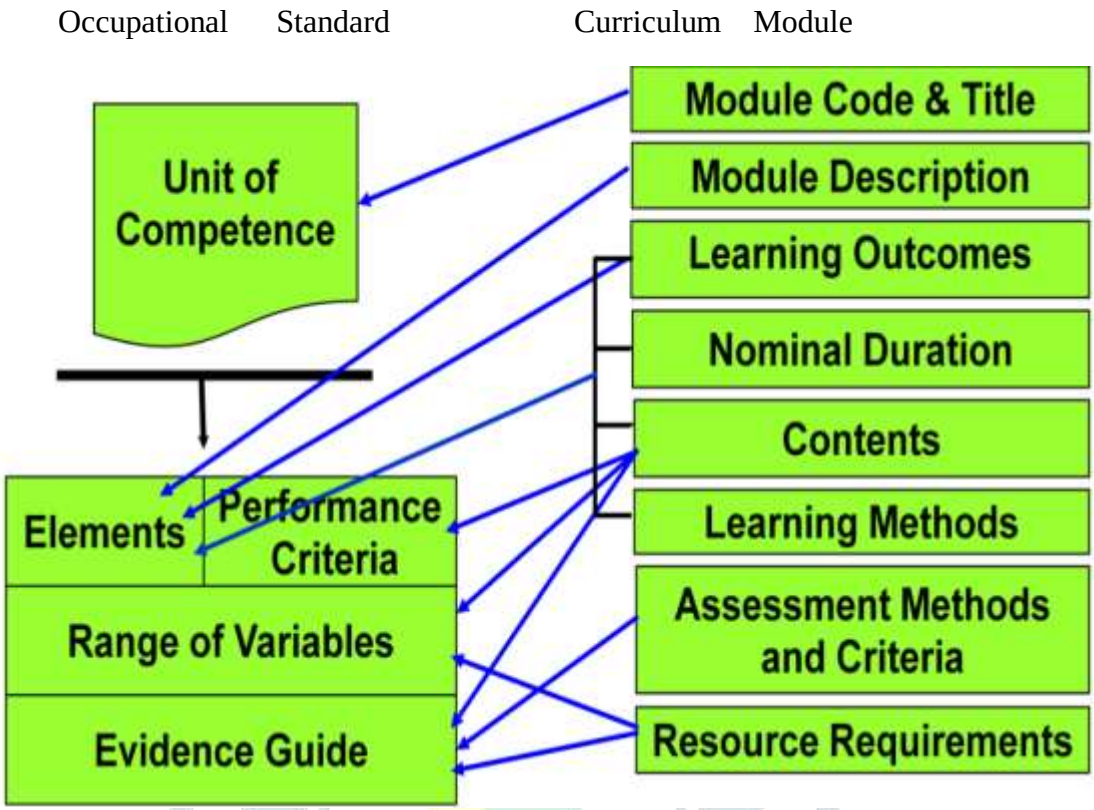


Figure 6. Source: Ministry of Education, 2011. TVET Curriculum, (Development A relationship Between Occupational Standard and Curriculum Module.)

Occupational standards define the competencies of a worker according to requirements in the labor market. As outlined above, occupational standards comprehensively describe the competence a person has to achieve in order to be considered "qualified" in a certain field. Competence includes the entire range of skills, knowledge, and attitudes necessary to perform a specific job. Occupational standards are developed for all occupational fields at all relevant qualification levels attainable within the TVET system. Each occupational standard can be broken down into units that describe a set of "employable" competencies. Occupational standards are described in the same, nationally approved, format and are publicly available. This enhances transparency about occupational qualifications among employers, trainees, and TVET providers. [18]

Reform Adopting Direction and Suggestion

One of the main strategies for enabling flexible TVET delivery and flexible entry and departure points is the modularization of TVET. It is necessary to build a research, curriculum, and learning tool development center for technical and vocational training. Technical and vocational training should be supported by a system of research, curriculum, and instructional materials. Professional associations, trainers, and industry experts should evaluate the curriculum development. Curricula should be developed with the timely production and adjustment of professional standards as its foundation.

3.4. School–Enterprise Cooperation

Facts and scientific Aspects

Ethiopia's TVET system is based on Germany's dual-training system, which recognizes the importance of industry training vs enterprise training and cooperative training, in recognition of this strength. The term "TVET training" refers to the use of bilateral training, a training approach that incorporates hands-on instruction in either industries or businesses directly relevant to the profession and at institutions that offer technical and vocational education and training.

In Ethiopia, the TVET system has envisioned a strong partnership between the public sectors and medium and small enterprises (MSE, hereunder) to deliver a cooperative and in-company training which takes place in the training institution and at the place of work to improve the relevance of the training offered to employers' needs [19]

Foreign Policy Perspective

The theory of integration of production and education has-been mature in developed countries, and the specific implementation of each country has its own characteristics: the first type combines traditional apprenticeship training with school education, focusing on enterprise training, supplemented by school teaching, and emphasizes the need to strengthen the training of students' practical ability. The most typical ones are the "dual system" in Germany, the "combination of production and education" in South Korea, and the "enterprise visit system" in Japan. The second type emphasizes the combination of teaching and labor, introducing the simulation practice teaching methods in teaching, taking students as the main body and ability as the standard, such as the "work study alternation system" in Britain and the "CBE mode" in Canada. The third type focuses on school teaching, permeates the educational concept of lifelong learning, and focuses on the cultivation of students' comprehensive quality, which is industry oriented, such as the "apprenticeship training center system" in France and the "new apprenticeship system" in Australia.

Since the implementation of the integration of industry and education in vocational education, China has actively learned relevant theories and practices from developed countries, especially Germany Since the 21st century, the integration of industry and education in Germany has been reformed and explored. With the remarkable changes in Germany's social economy, production conditions and customer needs, new technologies, new products and new processes are constantly emerging, and the industrial base and development environment of the manufacturing industry have undergone dramatic changes. In addition, industry is compared with the speed of industrial transformation and upgrading, the German education sector has lagged behind in its demand for the training specifications, quality and quantity of technical and skilled talents. Colleges and universities need to innovate teaching methods to train talents needed by the industry efficiently and quickly [20] .

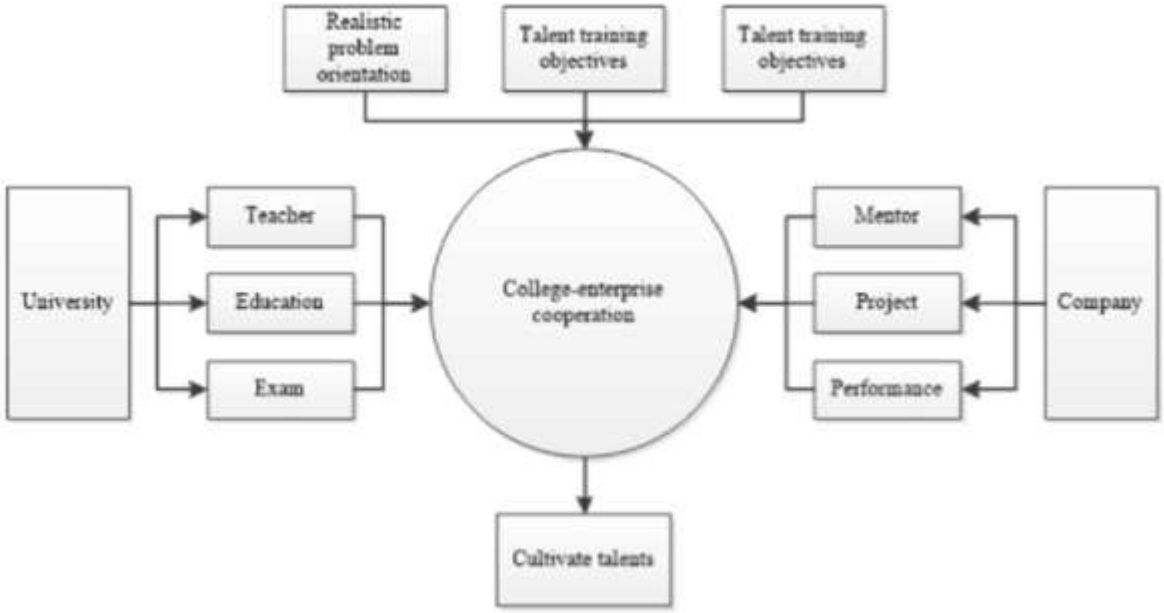


Figure 8. Source; Conference on Educational Innovation and Multimedia Technology (EIMT 2023)

Domestic Approach

Implementing a cooperative training system in Ethiopia that adopt from Germany's and other nations' "Dual Training System" expertise. According to a pre-prepared plan and an agreement reached by the cooperation of training institutions, industries, and enterprises, technical and vocational education and training is a training process that is implemented in these settings. For years, thousands of students, businesses, and technical and vocational education and training institutions have engaged in and profited from cooperative training, which has been regarded as and implemented as a major training strategy in our nation's technical and vocational training system. The lack of laws and regulations governing the implementation of cooperative training, as well as the absence of a system of rewards for cooperative training providers, prevented the cooperative training from producing the intended outcomes because the stakeholders were not carrying out their duties and responsibilities correctly and the training was not being implemented at the necessary level.

These implications have become particularly clear since the Belt and Road Initiative in 2013. More than a dozen workshops in the name of Lu Ban, a craftsman in ancient China, have emerged across the African continent in the past five years. Providing high-level vocational education for young Africans, these workshops symbolize an integral facet of Sino-African cooperation in talent development. Luban Workshop advances knowledge sharing, talent development in Ethiopia The workshop in Ethiopia is a collaborative effort between the FDRE Technical and Vocational Training Institute and the Tianjin University of Technology and Education, and was inaugurated in 2021. Offering specialized courses in industrial robotics, mechatronics, industrial control, and industrial sensor technology, the workshop's aim is to train the modern industrial technicians much needed by Ethiopia's evolving industrial landscape.

Reform Adopting Direction and Suggestion

An Enterprise, the business community, professional associations, industry, and relevant partners to become active participants and owners of the cooperative training, a strategy and legal framework for the program must be prepared.

- ✓ The creation of a system that allows for the provision of cooperative training via a variety of other approaches, based on what works best for each location and training facility.
- ✓ If the necessary promotion system is facilitated by the government using various options for the industry to actively participate in the cooperative training and to manage the activity as an owner (levy, tax reduction, recognition certificate)

3.5. Greening TVT

Facts and scientific Aspects

The shift to a low-carbon economy and a society that is climate resilient is aided greatly by TVET. It is accomplished through TVET's conventional responsibilities of preparing students for particular career paths and boosting their engagement with the workforce. There are new demands placed on these conventional responsibilities.

The greening of TVET institutions will promote learning and a changing community in addition to adding value to the regular institutional development process a workers who is more employable than someone who lacks these qualities is one who has knowledge, skills, and competences related to green jobs. In the event that job procedures change, displaced workers may be retrained and up skilled to enable them to find employment in different industries, helping them to find new positions and businesses to fill them. [21]

Foreign Policy Perspective

Sustainable lifestyles satisfy current demands without endangering the capacity of future generations to satisfy their own. Enhancing sustainability involves both individual and group efforts that are shared by local and international populations. They call for a fresh, well-rounded perspective on how people engage with one another and the environment.

The knowledge, abilities, beliefs, and worldviews that people need to act in ways that support more sustainable lifestyle patterns are developed through education for sustainability. It makes it possible for people and groups to consider how they see and interact with the world. Future-focused, sustainability education aims to preserve ecosystems and use educated action to build a more environmentally and socially just world. Measures to encourage more environmentally friendly lifestyle choices need consideration of environmental, social, cultural and economic systems and their interdependence. [22]

Domestic Approach

Greening TVET training is a novel concept for TVET training in our nation, and attempts have made to incorporate it into the 2020 TVET training policy and plan. Nevertheless, since it has not implemented yet, it has brought up again and deserves consideration. Therefore, it is imperative that training become green in order to meet the nation's future development goals and create a workforce that can compete globally. To this end, stakeholders and partner organizations must collaborate to ensure that the training was conducted in an environmentally responsible manner.

Reform Adopting Direction and Suggestion

- ♣ To spread awareness about Green TVET Training to the stakeholders involved in the TVET Training sector.
- ♣ Making the TVET training curriculum to include green TVET training skills
- ♣ To make TVET training institutions to follow green practices to be an example of green economy
- ♣ Need-based support for enterprises to adopt green productivity through industrial extension support

3.6. Technology Transfer

Facts and scientific Aspects

As technology plays a significant role in the process of economic and social change in a country, increasing the use and use of technology in the economy will improve product quality, increase production and productivity, generate new knowledge, improve living standards, and make export and import trade more balanced and efficient.

The process of copying, adapting and transferring technology in the technical and vocational education and training sector has been going on for years, but performance reports show that the implementation is inconsistent and the performance is low. Therefore, it is important to explore the operational and implementation processes to increase competitiveness by combining technology transfer work with development programs in a way that can enhance and benefit the industry in the future.

Foreign Policy Perspective

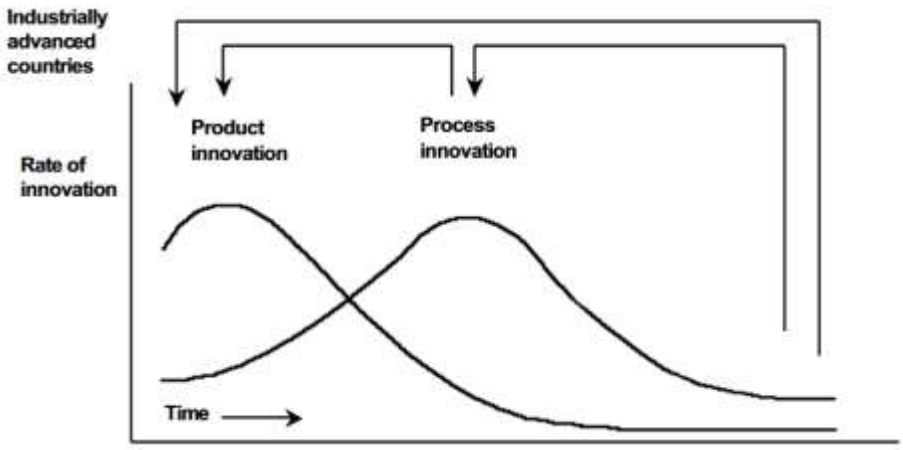
In today's era, knowledge, skills and technology are considered very important assets in terms of their contribution to economic growth. Technological capabilities have increased global competition between developed and developing economies, prompting many countries to look beyond their national borders for technology transfer this has led to the use of many methods to access technology between countries and introduce innovations from developed countries to developing countries

Countries use different technology transfer strategies and tactics to change their growth and income and build high industries. In the 1960s and 1970s, South Korea acquired foreign technologies, imitated them and integrated

them in various ways. In the 1980s and 1990s, South Korea made great efforts to increase/strengthen the development of the technology, building the capability of simulating innovation and being able to reach a middle level of technology. As industries expand, Korean companies are able to enter the market by diversifying into standardized, low-cost products, increasing their production efficiency, and facing competitive threats by improving their indigenous knowledge capacity and producing value-added products.
In the 1980s, it has forced Korean companies to shift their focus from strategies that focus on labor-intensive technologies to knowledge-intensive intermediate technologies that bring relatively more knowledge to all sectors. As a result, they have made various efforts to solve the challenging problems they face in this process and to increase their capacity.

The Korean government has invested heavily in improving research and expanding research institutions, as well as working on up-to-date intellectual property rights and cooperation with other countries. By gradually increasing national capacity, they have been able to identify their important technologies, transfer technologies to them in a better way, quickly integrate themselves with innovations, and explore intellectual property rights in a manner suitable for their own contexts, bringing about technology transfer and building technological capacity.

Technological capability is the integrated ability to adapt to technological change, and this capability was achieved through the ability to adapt to technological learning. Adoption capacity is the result of existing knowledge and concerted effort. [23]



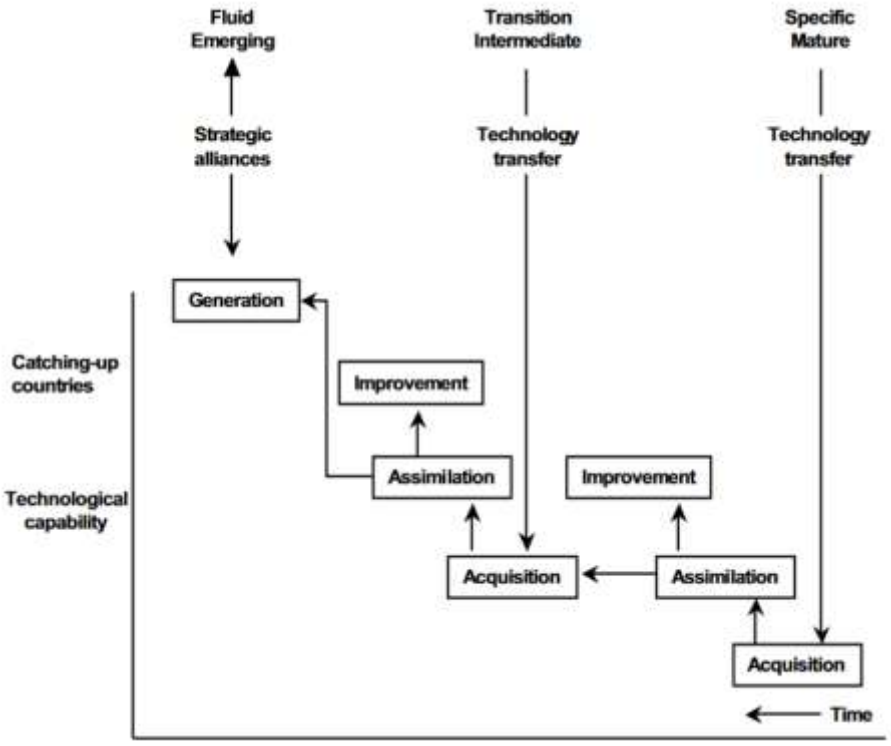


Figure 7 Source: Technological Trajectory framework (Kim, Linsu and Hosun Lee , 2003)

Domestic Approach

Ethiopia is one of the lowest countries in the world in the process of economic and technological transfer. As a country, various projects have planned and implemented to overcome this problem. Despite this, most of the economy is dependent on agriculture, with 70% of the population dependent on agriculture and rural economic activities for their employment and income.

Copying, adaptation, improvement and transfer of technology have done, but it has not been able to achieve the desired results. The reasons given for this are the inability to build a capacity to copy the concept and scientific approach of technology, the inability to support the transition process with research, the lack of leadership and professional implementation and execution skills, attitude problems, the problem of resources to copy, adapt and transfer technology, associating technology with one's own needs and benefits.

Reform Adopting Direction and Suggestion

- ♣ Supporting technology transfer processes through research and making it work based on value chain analyses
- ♣ Building the capacity to copy, adapt and transfer technology (for example, hiring high-quality professionals from abroad for a short period of time
- ♣ Establish a system that encourages professionals who design, improve, create and transfer technologies and provides recognition and protection for their work in line with the actual situation of our country
- ♣ Forming a system that allows working with technologies individually, in groups and with other stakeholders
- ♣ Creating a technology database that can organize the information of developed technologies and doing counting work (Auditing)

3.7. International relations, cooperation and partnership

Facts and scientific Aspects

International cooperation, often facilitated by organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), has emerged as a key strategy for addressing the digital divide and advancing global digital transformation in TVET by promoting the sharing of knowledge, resources, and best practices across borders. The importance of digital transformation also lies in its potential to improve the quality and standing of TVET. The education sector recognizes the integration of digital technologies as a means to enhance learning outcomes, expand access, and foster innovation in teaching and administrative practices. In TVET, digital transformation can enable more flexible, learner-centered pedagogies, facilitate the development of 21st century skills, and strengthen engagement with industry partners. [24]

Reform Adopting Direction and Suggestion

various international experiences, including Germany, especially in countries that have achieved results in the field, one of the main reasons for this training institutions have difficulty in supplying the materials required by the working world. Therefore, in these and similar matters, it is possible to work together with governmental or non-governmental organizations and to use available support in a sustainable and higher level, when it is possible to create a legal and cooperative framework of stakeholders.

Domestic Approach

Looking at the current situation of our country, partner organizations are showing a better interest in supporting TVET training, although not in an organized and coordinated manner, TVET offices and training institutions are receiving various supports by creating cooperation and partnership both within and outside the country.

In addition, the increasing interest of international support institutions to support the sector is seen as a good start, but limitations are also widely seen. The technical and vocational training system suffers from weak government-private sector partnerships and opaque relationships among partner organizations who focus on their chosen areas without addressing national development priorities. Their collaboration with training institutions raises issues about fair practices and effective management operations. The national technical education prepared in 2000 the TVET Strategy specifically addresses the need to define relationships with external non-governmental organizations, but does not include solutions that bring about effective collaboration and partnership among stakeholders. On the other hand, the 2020 technical and vocational education and training policy and strategy document is a document that shows the cooperation and partnership between stakeholders.

Reform Adopting Direction and Suggestion

- ❖ Creating cooperation and partnership with the stakeholders of the sector following the country's foreign relations policy and the development direction of the government
- ❖ Creating a cooperation and partnership system that includes technical and vocational institutions as well as the industry and is based on mutual benefit
- ❖ Enable stakeholders to lead by preparing a legal framework that can make cooperation and partnership effective

3.8. Digital technology

Facts and scientific Aspects

Education and training institutions every citizen has to have access to lifelong learning opportunities and the knowledge, skills, and attitudes necessary to live and work in a world that is becoming more and more reliant on technology. This applies to all levels of education and training institutions. ICT has the potential to be a very effective instrument in ensuring that education and training are accessible to all. Basic ICT abilities are necessary for all citizens in the twenty-first century, but globally, there is also a great demand for skilled graduates with specialized IT skills. The development of an open and sharing culture will be essential if TVET systems are to stay up to date and guarantee inclusive learning procedures that are accessible to an increasing number of learners. In a world where everything are changing place faster than ever before, teachers themselves are learners, no less than their students. In today's world, networking has become the most important resource off-line and online. [25]

Foreign Policy Perspective

Digital Transformation has generated much research and curiosity in recent years from both an academic and practitioner perspective, not least in Information Systems (IS) research. Indeed, in 2020, the current COVID-19 global pandemic is accelerating the pace of digital transformation within organizations of all types and sizes, across all industry sectors

Reform Adopting Direction and Suggestion

a. Digital technology infrastructure

- ♣ To have policies, standards and frameworks to establish a digital system in the field of technical and vocational training;

- ♣ Digital technology base-developments for all TVET institutions at all levels in a standardized way, to fulfill and connect them, by strengthening the relationship with partners by reading Institutions facility mapping and Donor mapping information. Apply as appropriate;
- ♣ Making education and training infrastructure construction, facilities and services supported by digital technology, AI and IoT about connecting devices and automating processes for developing digital content
  b. Use of digital technology and digital system
- ♣ Establishing a support and monitoring system to implement capacity building and change activities that can develop the use of digital skills and technology in the field of technical and vocational training from archiving processes to data analysis

4. Conclusion

The evidence obtained and comments received led to the following conclusions, and gaps identified; efforts to overcome the ensuing issues. Although the tailored (customized) new reform TVET policy and stagey model it will make it possible for top management to obtain the necessary data in order to decide and guide actions appropriately. By reviewing and highlighting the successes and shortcomings in the implementation of the current technical and vocational education and training policy and strategy, as well as by presenting recommendations for change that should be implemented consistently.

REFERNCES

[1] Moshe, "Ethiopia National TVET Strategy," kstvet.ac.ke, Addis Ababa, 2020.

[2] UNESCO , World Bank, ILO, "New report by UNESCO, World Bank and ILO says Technical and Vocational Education and Training must improve to meet skills and labour mismatch," World Youth Skills, INDIA, 2023.

[3] Caroline Fawcet , "TVET MODELS, STRUCTURES AND EVIDENCE FROM THE EUROPE & EURASIA REGION," *USAID*, pp. 3-4, 2014.

[4] USAID, United States Agency for International, United State, 2014.

[5] Setiaji et al., "Contribution of 21st Century Skills to Work Readiness in Industry 4.0," *International Journal of Advanced Science and Technology*, pp. 5947 - 5955, 2020.

[6] Edutopia, "Sustainability Across the Curriculum," 3 Feburary 2015. [Online]. Available: https://www.edutopia.org/practice/integrated-studies-sustainability-and-cross-curricular-connections.

[7] Teferra et al., "Ethiopian Education Development Roadmap," unesco, Addis Ababa, 2018.

[8] MoSHE, "Ethiopia National TVET Strategy," kenya school TVET, ADDIS ABABA, 2020.

[9] ISCED, "The International Standard Classification of Teacher Training Programmes," *e-Commons*, pp. 30-35, 2024.

[10] Ling, ""Overview and developmental analysis of China's technical and vocational education and training,"," *International Journal of Innovative Research and Scientific Studies*, pp. 251-252, 2024.

[11] Yinghui Fan et al., "Overview and developmental analysis of China's technical and vocational education and training," *International Journal of Innovative Research and Scientific Studies*, pp. 251-252, 2024.

[12] UNESCO-UNEVOC'S, "Compiled in collaboration with the National Centre for Vocational Education Research (NCVER), Australia.," NCVER, un, 2018.

[13] UNESCO-UNEVOC', "Compiled in collaboration with SEAMEO VOCTECH & Technical Education and Skills Development Authority (TESDA), Philippines.," UNESCO, PHILIPPINES, 2019.

[14] w. B. EASTRIP, "Regional TVET Qualifications Framework – EASTRIP," 17 June 2024. [Online]. Available: https://www.iucea.org/publications/qa-policy-tools-.

[15] S. Bhattarai, "TVET Curriculum Development-Ensuring 21st Century Skills," colombo plan state college HRD Pacific Region, Metro Manila, 2023.

[16] UNESCO-UNEVOC, "Pathways to strengthen TVET in Ethiopia," German Federal Ministry for Economic Cooperation and Development (BMZ) and KfW., Ethiopa, 2024.

[17] L. G. Wariyo, "Technical Vocational Education Training Institute Curriculum Development in Ethiopia," *Journal of Education and Vocational Research*, pp. 21-22, 2018.

[18] L. A. Wudneh and A. Dagnew, "Practices of Cooperative Training in the Amhara Regional State TVET Colleges and Companies, Ethiopia," *Taylor & Francis*, pp. 2-17, 2022.

[19] Zhen Zhang, "Strategy exploration of school enterprise cooperation in higher vocational colleges," *Journal of Education and Educational Research*, pp. 118-119, 2022.

[20] UNESCO-UNEVOC, "Greening Technical and Vocational Education and Training A practical guide for institutions," UNESCO, International Centre, Campus,Germany, 2017.

[21] A. a. R. A. (. Australian Curriculum, "Sustainability (Version 8.4) - Australian Curriculum," Australian Curriculum, Assessment and Reporting Authority (ACARA) , Sydney, 2017.

[22] Kim, Linsu and Hosun Lee , Technology Transfer & Intellectual Property Rights, Seoul: International centre for Trade sustainable Development, 2003.

[23] W. W. C. S. P. U. Xinbin Yang1, ""Advancing digital transformation in TVET through international cooperation: Approaches by the UNESCO Chair on Digitalization in TVET,"," *Vocation, Technology & Education* , pp. 1-3, 2024.

[24] UNESCO-UNEVOC, "TVET in a Digital World," UNESCO-UNEVOC International Centre, UN Campus, Platz der Vereinten Nationen 1Bonn, Germany, 2020.

[25] D. S. A. P. McCarthy, "Digital Transformation Leadership," *Research Gate*, pp. 1-34, 2022.