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TECHNICAL EDUCATION IN EGYPT: AN ANALYTICAL STUDY OF STRUCTURAL CHALLENGES AND REFORM PROSPECTS IN LIGHT OF EGYPT'S VISION 2030

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ABSTRACT

Technical and Vocational Education and Training (TVET) reforms in Egypt represent a critical pillar for achieving comprehensive economic and social development, aligning with Egypt's Vision 2030. This study aims to provide a critical analysis of the current structure of the TVET system by deconstructing its organizational components, identifying structural gaps, and benchmarking its practices against successful international models, including those of Germany, Malaysia, India, and France. Adopting a descriptive-analytical methodology supported by a comparative approach, the study evaluates challenges related to governance, the geographic distribution of institutions, curriculum alignment with labor market demands, and the positioning of TVET within national human development policies. The research also examines Egypt's reform efforts over the past decade, particularly the establishment of technological universities, the expansion of applied technology schools, and the diversification of post-secondary vocational pathways. The analysis indicates that the TVET system of Egypt remains a victim of structural drawbacks such as ineffective and fragmented supervision, incoordination of systems involved, fewer geographical links to the remote governorates, and low affiliation between the outcome of the education with the productive sector. Moreover, the absence of a national system of accreditation and quality assurance that ensures systemic efficiency in the development, maintenance, and promotion of policy, and equity in access to both educational and professional opportunities is also identified in the study. Drawing on international best practices, the study calls for the adoption of an integrated reform model built upon five foundational pillars: establishing unified governance for the system, ensuring regional equity in institutional distribution, developing skills-based future-oriented curricula, forging sustainable partnerships with the private sector, and elevating the status of technical education in social and media policies. Ultimately, the study concludes that TVET reform in Egypt is not merely a technical intervention but a strategic transformation that demands political will and a fundamental reconfiguration of the relationship between education, the economy, and sustainable development.

KEYWORDS: Technical Education, Vocational Training, Education Reform, Labor Market, Educational Governance, Sustainable Development, Egypt Vision 2030, Education Policy.

1. INTRODUCTION

Amid the accelerating economic and social challenges facing developing countries, Technical and Vocational Education and Training (TVET) emerges as a strategic mechanism for achieving inclusive and sustainable development. In Egypt, the significance of this sector is particularly pronounced due to high youth unemployment rates, a persistent skills mismatch between educational outputs and labor market demands, and declining productivity levels across several industrial and service sectors (Alsardy & Gomaa, 2023). Within this context, the development of the TVET system is viewed not merely as an educational reform, but as a structural catalyst for reshaping the Egyptian economy and promoting social equity and professional inclusion for marginalized groups (Emara & Mohamed, 2021).

Although more emphasis is being put on modernizing TVET by the government, the sector still has numerous structural issues surrounding it to affect its performance, which include the capabilities and capacity of TVET to meet the demands of both the local and international labor market. This phenomena is systematically noted in the literature in the form of a persistent mismatch between the competencies of TVET graduates and the real demands on the labor market, contributing to a gradual increase in the number of graduates without any prospects of productive employment (Wang et al., 2021). In addition, the lack of integrated governance system and the decentralization of functions of control over various bodies, including the Ministry of Education, the Ministry of Manpower, and the Ministry of Industry, give rise to the overlapping mandate and lack of strategic coordination that harms both planning and execution effectiveness (Li et al., 2017).

Social and cultural barriers are also another source of problems to these structural problems. Technical education has remained an option of lesser value in the minds of most communities, which has led to low numbers of students enrolling in technical courses particularly in rural regions (Yuan & Han, 2023). These perceptions further create more social divisions and complicate the process of incorporating inclusivity and equity in the education system. Also, girls and children with poor backgrounds are disproportionately affected by economic barriers (i.e., lack of transportation, being unable to afford education, poor access to supportive resources), which makes the already low levels of access to vocational track even lower (Sallam, 2015; Assaad et al., 2010). On an institutional level, a combination of subpar infrastructural condition, insufficient

technological base, and an inadequate preparation of teaching staff, a significant portion of whom do not have industrial experience or even a professional development pathway (Wu et al., 2023). Also, curricula are typically conservative and too detached from contemporary pediments (competency-based learning), further distancing the vocational training and the demands of production (Ahmed & Sayed, 2021).

Through these "challenges," however, the last decade has seen a reassertion of reform attempts in Egypt to reinvigorate technical education. Among particular programmes, one can note the execution of dual education models, applied technology schools, and Integrated Technical Education Cluster (ITEC) in Assiut which are interpreted as reflected efforts to merge theoretical education and practice together with increasing the alignment of all institutions with the industrial sector (Ahmed & Sayed, 2020). Moreover, the number and scope of collaborations with the private sector have increased, including cooperative curriculum development and the opportunities provided in the form of in-factory training that have enhanced the employability of graduates and their level of skills in the chosen pilot programs (Helmy et al., 2020; Nguyen et al., 2022).

Nations, including Germany and Finland, have provided viable examples of how TVET can be integrated into the labor markets thanks to the harmonious governance, favorable legislations, and active provision of the institutions that are directly involved in striking economic deals (Suleiman & Al-Saudi, 2022; Aboulnil, 2023). The lessons presented by these models are very useful, especially in the reconstruction of the social perception against technical education and transforming into the rules of competence, innovation, and quality.

Against this backdrop, the current study seeks to find a critical analytical review of the TVET system in Egypt by undoing the challenges facing its structure and the society within, the effectiveness of the current reforms activities, as well as the general international experience in this respect. Finally, the paper aims to suggest a comprehensive strategic model of TVET development along the lines of competence, alignment, and inclusivity concept-thus providing greater workforce readiness and strengthening the role of the sector in the overarching economy development agenda in Egypt.

1.1. Research Problem

Although at governmental and institutional levels there are various programs considered to reform the Technical and Vocational Education and Training

(TVET) system in Egypt, the latter still exists in structural weaknesses that hamper its performance and ability to support labor market requirements and play its strategic role in stimulating development of inclusive economic and social development. These long-standing woes are manifested in various alarming ways: discrepancy between the outcomes of educational activities and the changes that have occurred in the needs of local and global economies; the absence of social attractiveness caused by the prevalent negative attitudes towards technical education in the society; insufficient and unsustainable alliance between educational institutions; and de-centralized governance structure with the responsibility divided between various agencies with no centralized vision at the national level. Besides, even the most diverse current models of reform lack more rigorous mechanisms of evaluation and have not been able to produce wide-scaled influence either in geographic inclusiveness or social equity, especially in regard to including the marginalized groups of the population in vocational training systems. What makes the situation worse is the presence of infrastructural shortcomings, inadequate faculty competence, and the continued use of outdated learning outcomes that do not reflect the imperatives of the Fourth Industrial Revolution or support the accretion of the entrepreneurial and digital skills necessary to engage in the digital economy.

Considering these issues, the fundamental quandary of this study is due to the fact that the multi-faceted diagnostic analysis of the TVET system in Egypt is direly needed. It involves critical analysis of existing structural and social limitations, evaluation of the success of the ongoing reform initiatives, and the consideration of the possibility of applying successful models that are present internationally. The research aims at developing a cohesive and comprehensive reform plan, which is based on the principles of competency and alignment and inclusiveness, based on the goals of sustainable development and Egypt Vision 2030.

1.2. Research Objectives

This study aims to analyze the current state of Technical and Vocational Education and Training (TVET) in Egypt and to identify pathways for its development in light of ongoing challenges and reform initiatives. The specific objectives are as follows

1. To analyze the role of TVET in supporting the Egyptian economy by aligning its outcomes with labor market needs and enhancing

employment opportunities, particularly in the context of technological transformations and Egypt's Vision 2030.

2. To diagnose the core challenges facing the TVET system in Egypt, including misalignment with labor market demands, negative societal perceptions, infrastructural and financial deficiencies, and fragmented governance.
3. To identify the key pillars necessary for advancing TVET, with a focus on curriculum modernization, the adoption of competency-based training models, and the promotion of partnerships between the public and private sectors.
4. To analyze the current governmental efforts aimed at reforming TVET and to evaluate their effectiveness in addressing structural imbalances and fostering integration between education and the labor market.
5. To examine the role of local and international stakeholders in supporting and developing Egypt's TVET system, including the private sector, civil society, and international organizations.
6. To explore the anticipated economic and social impacts of TVET reform in Egypt, particularly in terms of promoting economic growth, enhancing social equity, and expanding professional inclusion opportunities for youth.

2. METHODOLOGY

The study uses a descriptive and analytical approach to find out the current situation of Technical and Vocational Education and Training (TVET) in Egypt, investigate what are the challenges of TVET. and look at the effectiveness of ongoing reform measures regarding national policies and international experience. The study is based mainly on secondary information sources in the form of peer-reviewed academic reports, related government reports, and reports by international organizations, as well as strategic reports on policy solutions like the Vision 2030 by the Egyptian government. The analytical framework contains four main dimensions where the TVET (1) contribution to the support of the Egyptian economy was examined, 2) the structural and societal challenge hinders the development of the sector, 3) assessment of national models of reforms, such as applied technology schools and the system of dual education and 4) comparative analysis of international precedents, especially Germany and Finland countries.

No primary fieldwork is performed; however, the

work draws together the accessible quantitative data with a qualitative contextualization of institutional and social contexts. This will be used to develop a critical and holistic knowledge that will be used to develop policies and institutional practices that have the potential to enhance the TVET in Egypt.

3. RESULTS

3.1. *The Role of Technical and Vocational Education and Training (TVET) in Supporting the Egyptian Economy*

Technical and Vocational Education and Training (TVET) is an indicator of sustainable economic development in Egypt, particularly as the country confronts mounting challenges such as access to education by young people on the one hand and the high degree of youth unemployment, skills drift, and poor productivity in most of the significant industrial and services sectors on the other. In this regard, TVET becomes a strategic solution by which the inclusive economic growth of Egypt under Vision 2030 could be attained (Alsardy & Gomaa, 2023).

One of the main contributions of TVET is associated with underlying its capacity to cover the gap between labor supply and demand. This system assists in eliminating structural unemployment and makes the skills of the workforce match new requirements of the productive sector as it offers learners with job-related technical skills. It has been indicated that closing the skills gap by means of market-oriented training courses will help reduce unemployment levels largely, particularly in the youth segment, and it serves as one of the most important indicators to determine the efficiency of a given vocational training system (ElObeidy, 2016).

Besides its effects on employment, TVET helps to improve institutional productivity and service quality. The probability of applying the high standards of operations are more likely to be introduced by graduates who are equipped in both the theoretical and technical know-how that enhances the efficiency and competitiveness of public and private businesses. Local studies prove that the vocational education investment is positively associated with the growth in labor productivity, which proves once again the importance of TVET in supporting the economy (ElObeidy, 2016). Simultaneously, TVET heavily supports the development of small and medium-sized businesses (SMEs), the pillar of the Egyptian economy. High-quality technical workforce can help such enterprises enhance product quality and rationalize operations, as well as expand the level of input into the national

economy (Nguyen *et al.*, 2022). This means that, TVET has risen beyond serving the interests of big-scale employers yet it adds flair to the vibrancy of the grassroots economies. Socially, TVET provides a very inclusive platform to marginalized groups, especially where they are in the rural and underserved markets. It offers alternatives to university education and thus opens up economic access of acquisition and helps reduce poverty and social mobility (Emara & Mohamed, 2021). It is an inclusive role that makes TVET an appropriate resource in supporting equitable development and closing socio-economic gaps. In addition to this, the whole world is moving toward a green and digital economy, which has increased the importance of TVET even more. TVET institutions, through their unique understanding of the future, can provide future-oriented training that adheres to the sustainable development goals, as evidenced by the growing industry need for specific expertise in the energy field of renewable energy, smart technologies, and environmental controls (Brownie *et al.*, 2018). In line with this, the industry is emerging as a workforce readiness booster in the new markets.

However, the successful operation of TVET is rather closely related to a close working partnership between the educational establishments and the business world. Beneficial relations allow serving the curriculum design, guarantee topicality of training programs, and good work placement results of graduates. The more systematic the process of institutions cooperating with industry stakeholders, the clearer their ability to react to developments in the labor market and integrate innovative practices into their training patterns (Nguyen *et al.*, 2022). In economic terms, there is a payoff to investing in vocational education. Formal training is associated with elevated levels of wages and enhanced possibilities of employment; consequently, it is a cost-effective segment of national recovery plans, especially in the post-pandemic environment. However, to get the whole benefit of these, it is important to change public perception about technical training. Long viewed as a second-tier option, TVET must be repositioned as a respected and viable career path—a shift that requires not only policy reforms but also public engagement and cultural change (Emara & Mohamed, 2021). In sum, TVET holds transformative potential for Egypt's economy, provided that it is embedded within a comprehensive reform strategy. Such a strategy must include policy innovation, promotion of vocational work culture, and robust public-private partnerships. Just as importantly, reshaping public

perceptions of TVET is essential for securing widespread participation and elevating the sector's contribution to sustainable economic development.

3.2. Description of the Current Technical and Vocational Education and Training (TVET) System in Egypt

3.2.1. Secondary Technical Education: Structure and Trends

Secondary-level technical education forms the core of Egypt's TVET system and operates under the supervision of the Ministry of Education and Technical Education. This system encompasses various educational streams, including industrial, agricultural, commercial, and hospitality schools, in addition to the dual-system apprenticeship track and newly introduced applied technology schools established through partnerships with the private sector and international entities. As of the 2022/2023 academic year, Egypt had approximately 3,114 secondary technical schools serving over two million students, according to data from the Central Agency for Public Mobilization and Statistics (CAPMAS). Industrial schools account for about 54% of these institutions and enroll nearly 47% of all TVET students.

The distribution of graduates across specializations reveals that 51% come from industrial tracks, 35.5% from commercial programs, 11% from agricultural streams, and only 4% from hospitality education. This distribution indicates a concentration in industrial and commercial fields, reflecting labor market demand on the one hand, and suggesting potential sectoral imbalances on the other.

To enhance quality and employability, Egypt has introduced a model of applied technology schools, which numbered 62 by 2023, with nearly half located in Cairo and Giza.

These schools are built on tripartite partnerships involving the Ministry of Education, industrial partners, and international organizations. Their focus is on applied learning and curriculum alignment with the practical needs of the labor market, aiming to produce industry-ready graduates.

3.2.2. Post-Secondary Technical Education: Alternative Academic Pathways

To create parallel professional academic tracks that complement traditional university education, Egypt established technological universities under Law No. 72 of 2019.

These institutions offer a natural academic progression for technical education graduates and

provide tiered, application-focused degrees. As of the 2023/2024 academic year, there were ten technological universities distributed across governorates such as Cairo, Giza, Alexandria, Beni Suef, Assiut, Gharbia, Dakahlia, Fayoum, and Luxor.

These universities offer specialized programs in high-priority economic sectors, including information and communication technology, renewable energy, oil and gas technology, food industries, agricultural machinery, and transportation and logistics. They grant professional degrees at multiple levels, including the Higher Professional Diploma, Professional Bachelor's Degree, Professional Master's Degree, and Professional Doctorate. This academic structure is designed to close the gap between educational outputs and developmental needs by producing graduates with practical expertise and market-relevant competencies.

3.2.3. Vocational Training Outside the Formal Education System

In Egypt, vocational training operates alongside formal technical education through a decentralized network of training centers affiliated with various ministries and executive bodies. These include the Ministry of Military Production, the Ministry of Housing, the Ministry of Trade and Industry, the Ministry of Labor, the Ministry of Agriculture, the Ministry of Health, the Ministry of Transport, and Ministry of Tourism. Although there is no unified national database to comprehensively account for these centers, data from the Central Agency for Public Mobilization and Statistics (CAPMAS) for the year 2021/2022 estimates the number of government-run vocational training centers at approximately 511, with 20.9% of them concentrated in Cairo.

These centres offer short- and medium-term training programs in a variety of occupational fields, often developed in coordination with productive sectors to meet immediate labor market needs. In addition, the Ministry of Social Solidarity operated around 124 vocational training centers in 2021/2022, while the Ministry of Labor managed approximately 75 centers, including 38 centers distributed across 27 governorates.

These non-formal training institutions play a complementary role in building job-relevant skills, particularly for populations outside the traditional education system.

However, the absence of an integrated governance framework and a centralized monitoring mechanism limits the ability to assess their performance systematically and align them effectively with national workforce development

strategies.

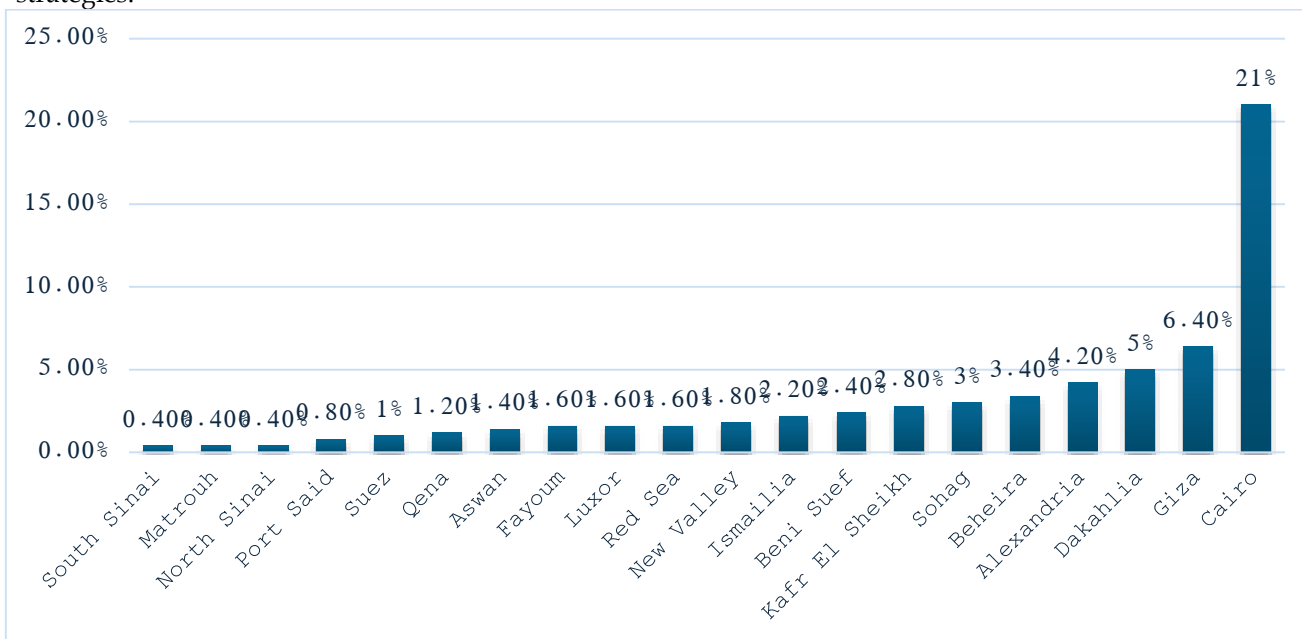


Figure 1: Government Vocational Training Centers by Governorate (2021/2022).

Source: Central Agency for Public Mobilization and Statistics (CAPMAS), Annual Bulletin of Education and Training Statistics for Governmental and Private Sector Training Institutions, 2021/2022 Edition, published August 2023.

A Critical Assessment of the Current TVET System in Egypt Despite the notable progress Egypt has made in the field of Technical and Vocational Education and Training (TVET)—evidenced by a remarkable jump of 35 positions within a single year (2022–2023), according to the joint report by the Mohammed bin Rashid Al Maktoum Foundation and the United Nations Development Programme (2023) (see Figure 2)—this quantitative advancement conceals deeper structural challenges that continue to hinder a qualitative and sustainable transformation in this vital sector. While the upward shift in international rankings reflects growing national attention and

reform momentum, it cannot be considered satisfactory to beat the heavily established problems of the TVET environment. These are disjointed governance, little institutionalization, primitive curriculum, inequalities in access between regions and enduring mismatch between training and actual labour market requirements. Unless such deep rooted systemic obstacles are overcome, it will likely leave the improvements to be shallow and unsustainable as they cannot lead to the inclusive economic growth promised in the long-term strategic plans currently adopted in Egypt.

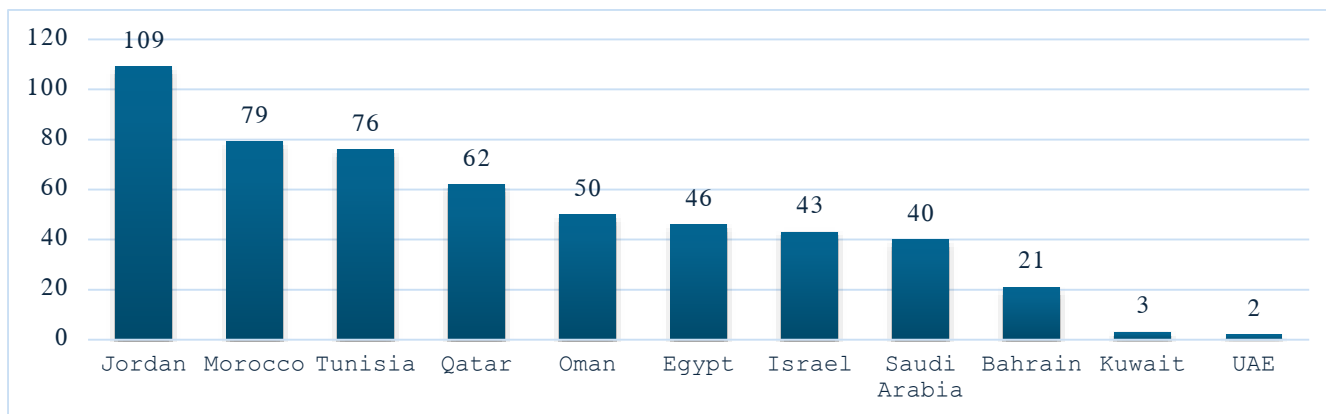


Figure 2: Egypt's Ranking in Technical and Vocational Education and Training (TVET) According to the Global Knowledge Index Compared to Selected Middle East and North African Countries (2023).

Source: Mohammed bin Rashid Al Maktoum Foundation and the United Nations Development Programme (2023). Rank 133 = worst, Rank 1 = best.

1. Geographical Imbalance: A Developmental Gap between Center and Periphery One of the most

prominent shortcomings of the current system lies in the spatial imbalance in the distribution of technical and vocational education and training (TVET) institutions. This includes traditional technical schools, applied technology schools, and vocational training centers.

Analyses conducted by the Egyptian Center for

Economic Studies, based on official data from the Central Agency for Public Mobilization and Statistics (CAPMAS), reveal a strong concentration of these institutions in governorates such as Greater Cairo, Dakahlia, and Sharqia. In contrast, Upper Egypt, border regions, and even Alexandria suffer from a severe shortage of such facilities.

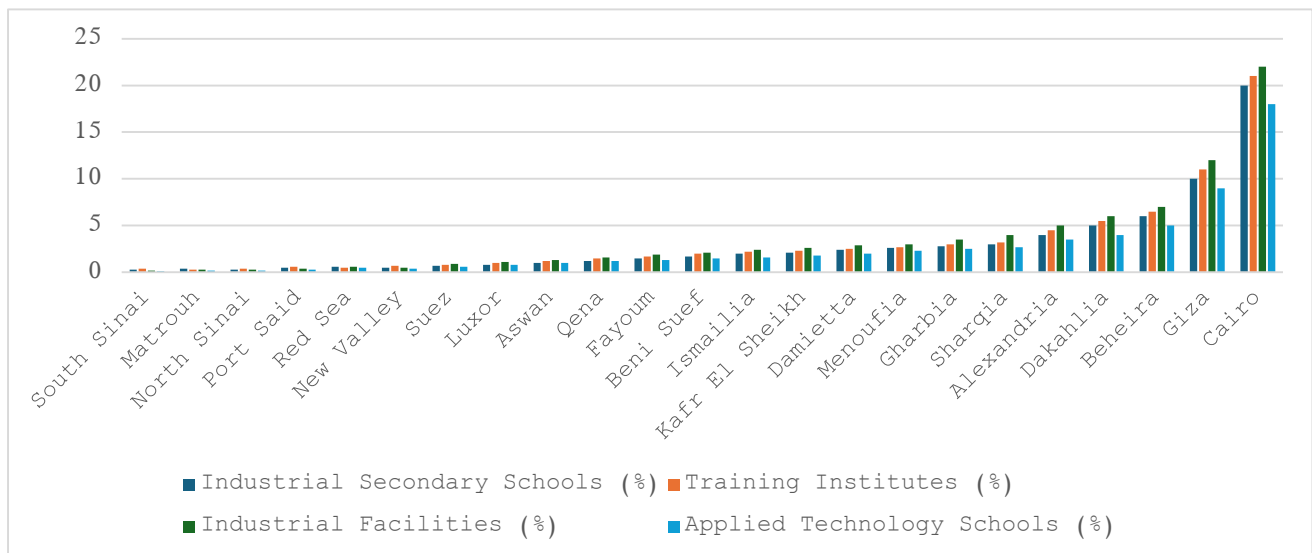


Figure 3: Relative Distribution of Industrial Establishments and TVET Institutions Across Egyptian Governorates.

Source: Prepared by the Egyptian Center for Economic Studies based on multiple data sources from the Central Agency for Public Mobilization and Statistics (CAPMAS).

This geographical difference expresses not only the absence of equality in educational opportunity distribution but also it leads to the uneven distribution of qualified human resources and proper labor in the nation. It reduces the capacity of the disadvantaged areas to achieve integrative and developmental participation. In addition, it highlights lack of a defined national policy on planning technical education in accordance regional supply and demand indicator of labor market.

2. Societal Perception and the Lack of Cumulative Incentives Even after persistent efforts in modernizing curricula and reinforcing institutional in-fra-structures, technical education in Egypt still finds itself struggling against a firmly held negative image. It is generally seen as a kind of non-academic (or lesser) path, which is usually viewed as exploring the lower end of the education system. This is worsened by disjointed commitment to an academic structuring, financial, and social opportunity, lack of professional options of development unlike graduates of general university studies.

3. Fragmented Oversight and the Absence of Integrated Governance Vocational training not part

of the formal system is governed through several ministries such as the Ministry of Military Production, Trade and Industry, Labor, Agriculture, Transport, and Tourism. But without a single, national system of coordination, governance and accreditation, they are compartmentalized. This leads to repetition of programs, differences in quality of training and reduced sensitivity to real labor market demands.

4. Quantitative Progress Does Not Substitute for Qualitative Depth Although Egypt made significant gains in the international ranking of TVET, this fact only suggests achievements on the level of numbers of schools, number of students attending TVET, and innovations on the public-private partnership, howbeit the lack of concrete assumed or actual qualitative progress is also possible and even probable. A gap between TVET outputs and labour market demands is still persistent. This is partly influenced by poor coordination with the productive sectors and the absence of a graduate tracking system that monitors employment rate and test the developmental effectiveness of the technical education.

Overall, technical and vocational education and

training development in Egypt cannot be based on individual reforms or skin-deep growth. Rather, it requires a comprehensive and cohesive practice which is premised on three pillars of strategy: a fair distribution of institutions by geographical distribution, diversification in the sector following areas of economic priorities and modernization of institutions. Such attempts should be supplemented with the involvement of the active cooperation with the private sector and the establishment of the national accreditation system and quality assurance system, as well as effective efforts to produce a quality image of technical education to society, where the overall picture of the sphere is rather negative.

3.3. Challenges Facing the Current Technical and Vocational Education and Training (TVET) System in Egypt

Despite the Egyptian state's recognition of the strategic the strategic value of technical and vocational education and training (TVET) to national development strategies, the sector remains to struggle with structural and societal issues that erode effectiveness of the sector. The most notable of them is the systemic discrepancies between what the education system produces and what is needed in the labor market. The Egyptian current TVET system is persistently failing to provide students with ability that the Egyptian economy needs, and leads to the existence of a deficiency of qualified labor and the increment in the job imbalance in the major economic fields. There is an apparent mismatch in the structure that prompts the immediate need to implement holistic changes and realign education outcomes with the demands of the labor market (Wang et al., 2021). The lack of a synergistic approach between education results and industrial availability has caused the entry of graduates in highly saturated jobs markets without being tied to the anticipated economic change with vocational training programs (Wang et al., 2021).

Making the matter worse are the societal beliefs that persistently influence the educational decisions of students. Technical education continues to have a poor reputation in the minds of many Egyptian students and their families as a second-rate alternative to academic programs, further solidifying stigma surrounding vocational streams (Yuan & Han, 2023). Encouraging a cultural transformation towards acknowledging the importance of vocational education and establishing it as such would greatly help in significantly improving its status and, consequently, would widen the scope of

students. Some strategic work aimed at rebranding TVET can drastically change the patterns of enrollment to help the system earn some respect it is worthy of (Yuan & Han, 2023). The access to vocational training is also inhibited by social and economic barrier, particularly to those who are marginalized (such as, girls in rural areas). Young women tend to attain lower levels of education due to early marriage and household duties and the pattern is likely to hamper their interest to pursue vocational training. The addresses of such barriers would involve specific intercession to advance equity and inclusion in education. Such programs as the Ishraq one that offers girls second-chance education can be mentioned as the evidence that it is possible to increase female enrollment in TVET, and to guarantee a better employment and financial security of women (Sallam, 2015; Assaad et al., 2010). At the institutional level, there are serious infrastructural weaknesses of the technical education system in Egypt. Some training facilities do not have proper workshops, tools and contemporary gears and this makes it hard to relate classroom learning and practice. This renders training very sterile and without application to the work place. Another essential problem is the low teaching staff competencies; most of the instructors do not have a direct industrial experience and fail to get professional development on an ongoing basis, which jeopardizes the quality of education (Wu et al., 2023).

Content of the curriculum is mainly outdated and theory-based where importance given to both applied skills and modern technologies is inadequate. Moreover, individuals in the industry stakeholders do not normally get the levels of participation required in the curriculum development, thereby producing graduates whose knowledge is not in alignment with the emerging requirements of industrial and technological spheres of life (Wang et al., 2021). Policy and governance-wise, a lack of unified national vision, as well as various institutions which take a technical education responsibility within the country (Ministries of Education, Manpower, and Industry), result in disassociation in the planning and inconsistencies in the policy directions (Li et al., 2017). There is no good and effective structure of accreditation and quality assurance which further undermines credibility of the vocational programs and restricts recognition of its graduates both nationally and internationally.

The other significant barrier is the inability to get exposure on industrial working environments. Certain students are often denied the opportunity of

getting the real working experience and this affects their readiness in employment. As a strong determinant of practical competence, the literature talks about the necessity of involving the real job practice in its practice as hands-on training (Nguyen et al., 2022). Besides, social and economic limitations, especially of girls in rural localities, have remained a drawback to access to vocational programs. Early marriage and conventional gender role assignments are great obstacles, and they may be one of the factors hindering developments in attainment of equality in education unless they are tackled. In Egypt, the TVET sector continues to face chronic underfunding and low investment, making it unable to modernize its institutions, equip them, and retain its staff. These problems are aggravated by the absence of sustainable funding of infrastructure and curricula and training (Widianingsih et al., 2018). Solving these difficulties will entail a multi-faceted approach that draws programs towards the requirements of the economy, enhances the outlook in the minds of the citizens, eliminates access issues, modernizes curricula, and closes funding deficits.

3.4. Core Pillars for the Development of Technical and Vocational Education and Training (TVET)

In Egypt, TVET is a national priority that is necessary to establish an efficient skilled workforce in line with national economic and social needs. Effective reform has to be based on major pillars and the first of these is reform of the curriculum with the help of industry. Public-private partnerships (PPPs) and competency-based learning (CBL) models are crucial because they increase the level of infrastructure and match training with the requirements of the marketplace and requirements of modern technologies in education (Sajida & Kusumasari, 2023; Helmy et al., 2020).

Immediately connected with this is the implementation of competency-based training systems, which are the means and methods of ensuring that TVET in line with the demands of the labor market. The most prominent case is the Integrated Technical Education Cluster (ITEC) in Assiut that has achieved significant success by implementing a model that has been produced through regional needs assessment skills, where high quality training was provided that was directly related to what was needed within the local economy (Ahmed & Sayed, 2021). It makes skill building far more effective and helps the graduates become more ready to work, which positively influences their employability to a large extent. Experience of other such initiatives proves that such a pedagogical

adjustment makes graduates work-ready (Ahmed & Sayed, 2020).

The second pillar is improvement of the quality of the instructions and delivery of training with the help of capacity building of the teachers and updating the teaching methods via active learning and digitalization. Technical education requires competent teachers (Brownie et al., 2018). Finland and Germany have positive examples of international models that the state can learn, as they have supportive legislation and have opportunities in the form of developed and flexible curricula (Aboulnil, 2023; Suleiman & Al-Saudi, 2022). Nevertheless, Egypt has not gained proper legislature support and encouragement in raising the status of TVET. Moreover, attitudes towards the academic route are still a going concern in cultures (Kamel, 2019), which is why awareness campaigns will be crucial to convince people of the worth of TVET as a career choice.

The third pillar is to create a deeper relation between TVET and the job market by integrating the student in on-the-job training courses as part of their learning, either in dual-ed programs or on-the-job internships in factories. It has been found that these types of programs can greatly benefit graduate employability and eliminate gaps in skills (Nguyen et al., 2022).

The fourth pillar brings out the heightened participation of the private sector in every phase of TVET development, such as curriculum development, provision of equipment investment, and involvement in the governance of TVET institutions. Applied Technology Schools in Egypt show a successful approach to effective productive intervention of the state and the business sector (Helmy et al., 2020).

The fifth pillar involves the upgrading of physical infrastructure in the technical schools and institutes. The quality of practical training directly depends on the availability of well-equipped laboratories, workshop and modern facilities, which influence the graduate preparedness. Future digitally enabled and interactive learning also requires the upgrading of institutions with the most updated technologies (Wu et al., 2023). Also the inclusion of digital skills and entrepreneurial skills within the TVET curriculum is a core pillar in ensuring graduates adaptability within the context of the fourth industrial revolution. Equipping students to be more initiative-taking, problem-solvers, and having the ability of design thinking increases their capacity as innovators and entrepreneurs (Hattab, 2014). In sum, these pillars establish the framework of the comprehensive and

futuristic transformation of the Egypt technical and vocational education system as the efficient driver towards inclusive economic development.

3.5. Ongoing Efforts to Develop Technical and Vocational Education in Egypt

Within the framework of the vision 2030 of Egypt, the educational field has evolved itself into a strategic priority, which is the purpose of the development of TVET system in Egypt that attempts to position education to face the reality of technological change and the needs of the labor market. The government has also initiated special initiatives and structural reform on quality, governance and partnerships. One of the main steps is the establishment of independence of quality assurance and accreditation authority in technical education that determines clear standards of assessment of institutions and outcomes, provides continuity of quality assessment by complying with global reference points (Ahmed & Sayed, 2021).

In parallel, Egypt has widened its dual education framework with a focus on integrating the educational system with an academic approach through practical experience and training in the workplace to increase employment readiness in students and link education with the labour market (Wang et al., 2021). The state, too, has opened schools of applied technology in collaboration with large firms such as El Sewedy Electric and Vodafone where students can receive competency-based training and receive employment opportunities (Helmy et al., 2020). One of the most prominent ones is Integrated Technical Education Cluster (ITEC) in Assiut that corresponds to the needs of the local industry, and enhances the overall image of technical education (Ahmed & Sayed, 2020, 2021). Moreover, the on-the-job training structures have grown with the involvement in the process by the private sector and proving successful in closing the theoretical and industrial practice divide (Nguyen et al., 2022).

Legal and administrative systems have been used to back the TVET reforms in Egypt, including the provision of frameworks aimed at teacher certification, the revision of occupation standards, as well as the implementation of competency-based education (CBT). Teaching and the engagement of students also became enhanced with the help of digital technologies (Wu et al., 2023). These reforms will have to take account of both historic legacies and international forces, as Ibrahim (2010) has put it and one in which context-specific and globally wise approach is needed.

The interest on incorporating entrepreneurship in

TVET is also rising to engage in self-employment and favoring informal economy (Hattab, 2014). Some new policies promote cooperations of education establishments and industry, and such a model as the UK Apprenticeship Program is proposed to improve the quality of training (Elkadi et al., 2024). The idea of distance-based education and digital devices, which are explored by Zakaria (2024), reinforce inclusive and accessible education more.

In spite of gaining ground, it is still difficult to maintain reforms, spread them countrywide, and gauge the effects on the labor market. There is the need of regime-long success through ongoing collaboration involving all the partners including government, industry, and international partners.

3.6. The Role of Stakeholders in Supporting Technical Education

The government, the private sector, international organizations and the civil society have a collective role in supporting TVET in Egypt. The state-led initiatives are no longer adequate; rather, jointed partnerships, especially the public-private partnership (PPP) have been of prime focus in reform. The introduction of PPPs increases curriculum relevancy and graduate employability via having industry participating in program design, equipment delivery, and on-site training (Helmy et al., 2020). The latter comes as an example of the Egyptian Education Initiative (EEI), in which multinationals have significant roles in the ICT sector (Ashry, 2024). On the policy level, ministries have encouraged smart technologies in education using the so-called strategy of the Digital Egypt, and more than 67% of the respondents perceive such initiatives positively (Ahmed, 2021). EU and the World Bank are only a couple of the international organizations that have contributed to TVET by funding, certifying trainers, and developing curriculum (Hadidi & Kirby, 2017; Helmy et al., 2020). At the same time, cross-border educational partnership has developed as a critical source of knowledge exchange and capacity building. As an example, the cooperation between the Newgiza University and University College London (UCL) provides the model that can be transferred to TVET, especially in terms of collaborative curriculum development and exchange between faculties (Rashid et al., 2019; Ragab et al., 2024).

The role of the civil society is also a very significant complementary role particularly in rural and marginalized regions. The non-governmental organizations conduct the community-based programs stimulating TVET, provide free training

programs, scholarships, and workshops to address the needs of the most disadvantaged groups. The initiatives aid in economics and social empowerment, specifically women and out-of-school youth (Ashry, 2024; Sallam, 2015). In spite of this success, structural obstacles still remain, standing in the way of sustainability and scalability of such partnerships. Insufficient connections between colleges and workforce, as well as the absence of a distinct institutional approach, have been previously identified as causing the shortage of innovative skills among graduates (Hadidi & Kirby, 2017). Consequently, to enhance TVET results, it is critical to create institutional coordination by means of consulting councils, discussions forums to discover skills requirements and periodic curriculum synchronization audits (Elkadi et al., 2024; Hadidi & Kirby, 2015). The Egyptian experience confirms that mixed collaboration between the state, the private sector and the international organizations and the civil society is a true lever in transforming technical education in case such a collaboration is based on a strategic, participatory plan, which targets sustainable reform and serious matching between education and the needs of local and international labor markets.

3.7. Anticipated Impacts of Developing Technical Education in Egypt

One of the main accelerators of the multidimensional transformation of Egypt is the further evolution of technical and vocational education (TVET) that is aimed at sustainable growth in various issues and aspects, such as economic development, the expansion of hiring, and the improvement of social equality. Modernization and redesign of TVET systems in Egypt will help it to transform its labour pool to fit the changing labour demands in the country and abroad. Among the most abrupt and immediate effects, the enhancement of labor market outcomes can be mentioned. Research findings unanimously indicate that there is a positive relationship between investment on vocational education and the total economic performance seeing as such programs impart on the learners practical skills that directly apply in work place settings. To give an example Hamidi and Said (2008) stress the importance of TVET in providing employability within the MENA region and especially, in Egypt where the segmentation of labor market by sectors is a problem. TVET can be the key in lowering unemployment rates, particularly among the youth because of resolving discrepancy between the products of educational systems and the demands of

the labor markets (Nilsson, 2010). Moreover, the introduction of active learning techniques into the system of TVET can greatly reinforce the cognitive and practical skills of studying students. The results of Hynes et al. (2008) were the same, in their study, the incorporation of problem-solving and critical thinking skills in secondary agricultural technical schools completely changed the academic setting and better prepared students to work in the job market. This follows the worldwide trend of competency-based education, which goes beyond just building skills but improving flexibility and innovation, which is a necessity in contemporary economic environments, where everything has gone very fast (Saeed, 2021).

In addition to the economic gains, the rise of the technical education also plays a significant role in social inclusion since it promotes the access to high-quality vocational education, especially concerning the marginalized groups of individuals. Hamidi and Said (2008) hold that there is a tendency to increase social inequality because of segregated educational systems and thus there is a need to have integrated policies to improve the status of TVET. The question is especially pertinent in Egypt; a place where a technical education is still by far an alternative to general course of education (Emara & Mohamed, 2021). The second imperative channel upon which TVET can deliver more extensive economic returns is industry alignment. Elkadi et al. (2024) advocated establishing collaborative innovation platforms with the aim of enhancing partnership between educational establishment and industry. Such mechanisms assist in making curriculum market oriented and improving graduate employability. In the same manner, the incorporation of digital tools and mobile learning platforms enhances the learning process and renders it more inclusive and close to real-life practice (Khalil et al., 2018). With these broad possibilities, the presence of the government and the policy structures becomes critical in the process of fuelling a successful reform of TVET. The sustainable financing, the development of the curriculum, and the integration of the private sector need to be implemented with the help of thorough policy support. Khalil et al. (2018) emphasise the need to develop education policies that are supportive and are responsive to the dynamics of the modern economy. Similarly, Saeed (2021) points out the necessity of sound quality assurance mechanisms that would guarantee further investment in TVET and its performance in meeting the demands of the labor market changes.

Leading International Models in Technical and

Vocational Education Reform: A Comparative Analysis

The reform of Technical and Vocational Education and Training (TVET) has become a central focus for policymakers and educational institutions worldwide, particularly in response to the accelerating changes in labor markets and the evolving demands for future-ready skills. Comparative analysis of international models provides a valuable lens through which to extract lessons learned and identify the most effective practices and policies across diverse national contexts.

One of the most cited global benchmarks is Germany's dual vocational training system, often regarded as a reference model for countries aiming to strengthen their TVET frameworks (Vujkov, 2024). This system combines on-the-job training within industrial enterprises with theoretical instruction in vocational schools, thus fostering a direct connection between education and labor market requirements. It has contributed significantly to enhancing employability and addressing skills gaps by aligning training content with industrial needs (Wieland, 2015). Numerous studies highlight the critical role that employers and policymakers play in the German system, ensuring that TVET outputs remain closely aligned with the needs of a modern economy (Deißinger & Gonon, 2016).

In contrast, TVET systems in countries such as China and the United States reveal diverse approaches to workforce preparation. China's reforms, in particular, reflect the demands of its fast-paced economic expansion, requiring flexible training models capable of accommodating both its large population and diverse labor skill base (Zhang & Ayob, 2024). A comparative study of TVET policies in China, Germany, and the United States underscores the persistent challenges of aligning vocational training with labor market demands while ensuring educational equity (Li *et al.*, 2023). Although Germany's system is effective, the study affirms that each country faces context-specific challenges that require tailored policy responses. Furthermore, modern pedagogical methods—such as project-based learning—have emerged as powerful tools to enhance the quality of vocational education. These approaches promote active learning, critical thinking, and problem-solving skills, which are increasingly valued in today's dynamic labor markets (Megayanti *et al.*, 2020). Research emphasizes that teacher training and development are foundational to improving TVET quality, as graduate competency is strongly linked to

educators' instructional skills and pedagogical capacity (Ji, 2022; Arinaitwe, 2021).

Recent studies also point to the rising significance of international cooperation in TVET, especially regarding the transferability of successful models across countries. Building collaborative networks between educational institutions and industries is seen as a prerequisite for the effective implementation of vocational systems, particularly in rapidly changing economic environments (Lysenko *et al.*, 2021; Terentyeva *et al.*, 2018). Closely related to these global trends are efforts to adapt TVET to the needs of diverse populations while integrating the Sustainable Development Goals (SDGs) and the principles of lifelong learning. Incorporating sustainability into vocational curricula not only addresses immediate economic challenges but also fosters a more inclusive and socially responsible approach to workforce development (Lambini *et al.*, 2021). In summary, leading international models in TVET reform demonstrate a wide range of strategies and practices. However, they converge on several key principles: aligning educational policies with labor market needs, ensuring active stakeholder participation, adopting innovative pedagogical approaches, and responding proactively to socio-economic transformations. These elements form the foundation upon which nations are building resilient and future-ready TVET systems capable of preparing skilled labor for the challenges of tomorrow.

Proposed Strategic Framework for Reforming Technical and Vocational Education and Training (TVET) in Egypt

In light of Egypt's Vision 2030 and the persistent structural and societal challenges facing the Technical and Vocational Education and Training (TVET) sector, this paper proposes a comprehensive strategic framework built upon three interdependent pillars: (1) alignment with labor market demands, (2) equitable and inclusive access, and (3) institutional modernization with enhanced governance and quality assurance. The aim is to transition TVET from a marginalized, supply-driven subsystem into a demand-responsive, innovation-led engine of economic development.

1. Alignment with Labor Market Demands

Establishing systematic linkages between educational outcomes and labor market needs is a foundational requirement for meaningful reform. This includes

- **Competency-based curriculum reform**
Designing demand-led curricula in collaboration with industry partners, emphasizing practical,

digital, green, and entrepreneurial skills—particularly in priority sectors such as ICT, renewable energy, and manufacturing.

- **Dual education and work-integrated learning** Scaling successful models such as applied technology schools and the Assiut ITEC Cluster, while embedding vocational training directly into workplace environments to bridge the theory-practice gap.
- **Sectoral skills councils** Establishing cross-sectoral dialogue platforms to identify future skill needs, update occupational standards, and align training programs with real-time labor market data.
- **Digital labor market intelligence tools** Utilizing data analytics platforms to support curriculum adaptability and inform education policy decisions.

2. Equitable and Inclusive Access

Ensuring inclusive and fair access to TVET requires addressing both economic and cultural barriers

- **Targeted enrollment policies** Expanding second-chance programs for marginalized youth and girls (e.g., the “Ishraq” initiative), and providing financial incentives and transportation support to improve rural participation.
- **Rebranding technical education** Launching national awareness campaigns to reposition TVET as a respectable and rewarding career path, particularly among students and their families.
- **Decentralized institutional expansion** Establishing modern technical centers in underserved governorates to reduce geographic disparities in educational and employment opportunities.
- **Flexible and digital learning pathways:** Integrating online education and modular certification systems to accommodate working learners, school dropouts, and non-traditional students.

3. Institutional Modernization and Effective Governance

Transforming TVET institutions requires robust governance structures, sustainable investment, and innovation-driven management:

- **Unified governance architecture:** Consolidating fragmented oversight currently spread across multiple ministries under a centralized national authority with clear coordination and cross-cutting mandates.
- **Independent quality assurance mechanism**

Operationalizing the newly established TVET Accreditation Authority to monitor institutional performance, accredit programs, and ensure alignment with national and international standards.

- **Professionalization of the TVET workforce** Establishing national academies for training technical teachers and trainers, with a focus on pedagogical innovation, industry exposure, and digital proficiency.
- **Infrastructure upgrading and technology integration** Equipping facilities and training workshops with smart technologies (e.g., interactive labs, virtual reality tools), and establishing incubators and innovation hubs within technical institutions.
- **Multi-stakeholder national and international partnerships** Institutionalizing collaborative platforms that bring together domestic industry partners, international donors (e.g., World Bank, European Union), and civil society organizations to co-design and evaluate reform interventions.

This strategic framework envisions a cohesive and future-oriented TVET system that is inclusive, responsive, and capable of preparing a skilled workforce to drive Egypt’s sustainable development.

4. CONCLUSION

Considering the structural and functional issues that are affecting the Technical and Vocational Education and Training (TVET) sector, in Egypt, this study finds that a revolutionary overhaul of the sector is not just a development option but a strategic action that would lead to further economic growth, greater levels of competitiveness within the labor market and social equality towards access to education and employment opportunities. Despite the fact that some positive steps could be traced in Egypt, which can be seen in the growing number of technical schools, the growth of institutions offering applied technologies and the improvement of the country positions in all the corresponding world rankings, real issues have not been resolved. Most of them are uneven geographic distribution of institutions, fragmented governance system, and disengagement between curriculum and actual requirements of productive economy. The comparative study of the best practices of such countries as Germany, Malaysia, India, France shows that the successful TVET reforming depends on a few essential pillars: the early integration of the technical education in the general school, the career guidance basing on the data, correspondence of the curriculum

with the requirements of the labor market, and the strategy of strong interactions with the private sector according to the unity of the system of the country regime and guaranteeing the quality. These models also indicate that successful reform lies in aligning educational policy in line with the national development objectives and the flexibility of the institutions to adapt to the changes in technology and the economy.

New models in Egypt have an encouraging prospect of change that includes technological university models and schools of applied technology. Nevertheless, they continue to need horizontal and vertical collaboration in the larger educational system, reasonable geographical spreading, the establishment of a powerful system of accreditation and professional recognition, and establishment of a dynamic system of graduate tracking that links learners with actual job opportunities. This paper,

therefore, suggests the implementation of a multi-level reform, comprising: reorganization of governance processes, development of results-based financing, the shift in educator training in TVET, the encouragement of enrolment by shaping a more positive image and a longer career and educational continuum. The involvement of the Sustainable Development Goals (SDGs) into the TVET ecosystem is the last item that should improve system resilience and responsiveness to emerging socioeconomic conditions. Conclusively, technical education in Egypt will need to be reformed better than increasing its institutions and/or undertaking comprehensive institutional change. It requires a paradigm shift in vision, management, finance and the integration of the labor markets, in such a way that, TVET can be more effective in materializing its potential as the mainspring of Egyptian economic and socio-development.

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