



## Enhancing Technical Vocational Education and Training (TVET) in Bangladesh: Overcoming COVID-19 Destruction and Focusing Towards IR 5.0

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### Abstract:

The invincible corona virus affected hundreds of thousands of societies on the earth. It massacred holistic pace of lives, disrupted academic excellence, economic growths and pushed us many clops of planned future. However, despite the current threat of total education with key constraints in Technical Vocational Education and Training (TVET), how drastically are TVET institutions adopting innovative planning and education governance in Bangladesh? TVET Policy actors, individuals, and relevant communities need to think of risk mitigation and resilience approaches. In general, the approach and solutions that drive towards cyber-supportive preparedness, networking, and partnership may help to tackle the emerging situation. EduTech can help towards the modern TVET system in Bangladesh with globalization and IR 4.0 to IR 5.0. Given this context, it is more challenging to achieve the United Nations (UN) Global Sustainable Development Goals (SDG) by 2030. The intertwined goals of inequality, education, and poverty eradication imply nourishing the TVET sector. This paper mainly focuses on reflecting on the ongoing managerial view of the TVET sector, exploring innovative ways to strengthen the system in Bangladesh.

**Keywords:** Education Governance; Innovative Planning; Cyber Supporting Preparedness; Networking and Partnership; SDG; TVET Inclusion; EduTech

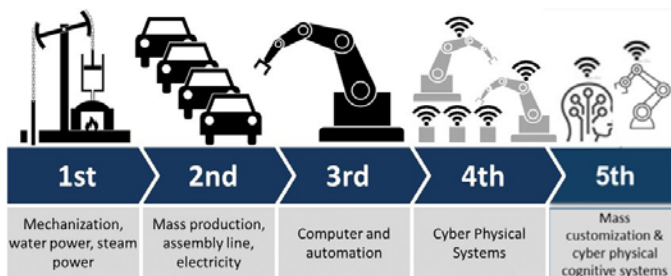
### Introduction:

Technical Vocational Education and Training (TVET) in Bangladesh aims to develop qualified and skilled human resources for national and international job placement. As a developing country, Bangladesh has tremendous opportunities for economic development by creating its huge population into a skilled work force through globally demanded technical and vocational education. Technical education curriculum objectives are generally set to provide domain specific competencies relevant to an occupation (Rauner, 2007). The prime focus of TVET is to put special emphasis on information technology and automation skills, all at the periphery of proficient techno minds. The emerging need for reshaped sectors and a competent trained resource pool who can work in the global wind of automation and IR 4.0, as well as the recently added IR 5.0 for economic enhancement. The education policy of Bangladesh emphasized education on information technology-based Bangladesh. Technical education curriculum objectives are generally set to provide domain specific competencies relevant to an occupation (Rauner, 2007).

Multiple changes have been made or are being made in the education system as it slowly gets back on track after the disruption that the pandemic has caused. All of these have caused a major stir among the students. The vision is to raise the virtual education domain. Even though it is growing again, the education ecosystem is still a normal one, i.e., a new normal world with the aroma of global education essence. Innovation and implementation of changed assails are revoking the curriculum for skilled employment. The system predicts that the future will change drastically from IR 4.0 to IR 5.0, and that e-learning and operational management will not be able to stop it.

International and national waves spread in nanoseconds with the cyber system engineering mechanism. The world's rapid internet communication technology changed our thoughts and calculations. At the domestic level, however, skill development has often been driven by a competitive race to attract foreign direct investment, particularly in relation to high-value sections of global supply chains (Ashton & Morton, 2005). The Skill Hub is a pressing issue and a requirement for long-term linear planning under global TVET and IR 5.0 (human-machine) for labour equity and rationale. Enhancing TVET in Bangladesh is an emerging phenomenon to promote employment rates and match global demand for smart employability as well as overcome post COVID-19 losses by using Artificial Intelligence (AI) in the TVET sector.

The first industrial revolution to the fifth industrial revolution has the mass customization ears for overproduction, and it's created mass employment and industrialization. Almost 100 years have passed since the beginning of mechanization (IR 1.0) in 1784. The electrification in IR 2.0 was from 1870 to 1969 and jumped to IR 3.0 considering the production of mechanization and electronics. The success of Industry 4.0 happened in less than 40 years (1979–2010). In 40 years from IR 4.0, with the growth of Cyber Physical Systems (CPS) and the Internet of Things (IoT), Only 20 years later, the global thinking of humans and machines combined could be the new industrial revolution. IR 5.0 as a possible future tenure until 2035 as human thinking, problem-solving hands in hands, and machine cognitive perfection. The pace is looking for more skilled and techno-functional graduates that could be fully TVET oriented, and without TVET, it is far away from economic growth. The space will lead robots and interconnect with the human brain as well as work closely with partners. It is an important forecasting feature and a powerful feature for the next.



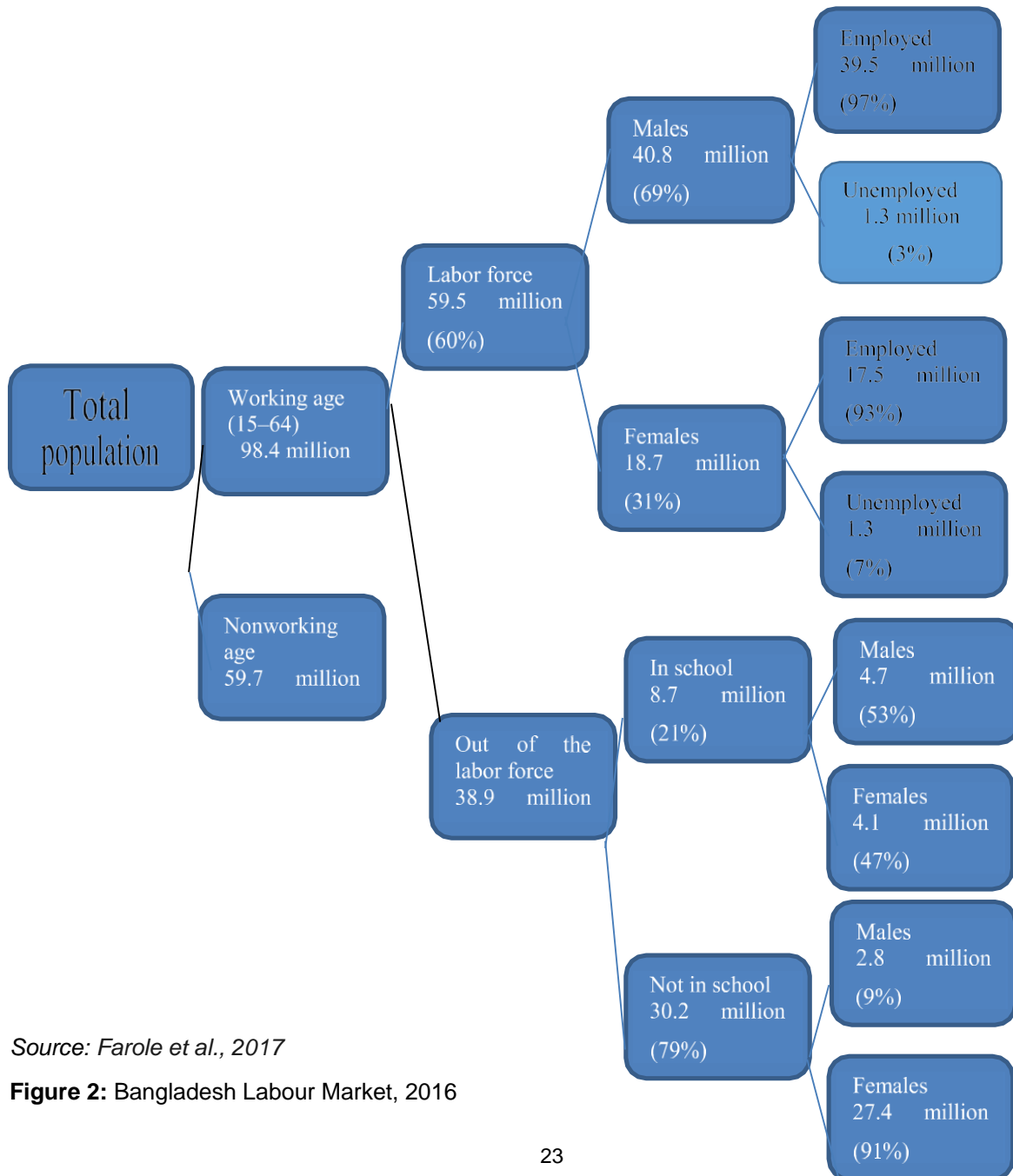
Sources: <https://www.researchgate.net/publication/334390284> & <https://www.focusondrives.com/wp-content>

**Figure 1:** Industreal Revolutions 1.0-5.0 and man and mechine

TVET provides learners with the requisite knowledge and skills for employment. TVET is treated as one of the most important tools for social equity, inclusion, and balanced and sustainable development. Just after the industrial revolution (IR) 4.0, a drastic change has occurred, compelling the industrial sector to ensure quality products and provide good service to the market. However, with this, there has been an acute shortage of a skilled workforce. The need for TVET has been recognized in order to meet the growing needs of people around the world.

A reliable quote from TVET amazes us: "While education is the key to any development process, TVET is the master key that can transform the world of work and the economy, alleviate poverty, save the environment, and improve the quality of life' ... (Luisoni, 2005).

There are many TVET institutions established worldwide to produce a skilled workforce. To ensure practical teaching and to make the learning of the learner's updated, TVET institutions are set up worldwide. In Bangladesh, just after the liberation war (1971), under the guidance of the Technical Education Board (BTEB), a few TVET institutions were established in the headquarters of some divisions of the country. A densely populated country with fewer minerals is deemed to focus on the development of youth as a human resource. The successive plan for youth can change the economic world by providing contemporary, demandable TVET education for employability (Ahmed, 2010). In order to produce a skilled workforce, these institutions have been playing a significant role in nation building. The following statistics are scenarios of Bangladesh:



Source: Farole et al., 2017

Figure 2: Bangladesh Labour Market, 2016

Solving and managing many problems with TVET in the current retro is quite difficult. The odd situation will turn into the new normal when the world will come closer under the online teaching lens as cyber innovation. However, not all issues can be solved with information and communication technology (ICT). Many problems will be solved with cyber inclusion support, ROBOT applications, and skill training (Department of Information and Communication Technology, 2018). Therefore, prescribed TVET course hours may be reduced, and it will be possible to squeeze course time. In order to reach more learners, the remote areas TVET course is doubled or tripled in length. this, it helps to generate a skilled labour force to fill the gaps in industrial needs.

#### **Objectives of the research:**

Currently, TVET is fully related to technology. Technology plays a vital and significant role in human development and any organization. Nonetheless, the digital innovation transformation increases global connectivity. increased productivity and the precession of time over the century. The system's processing and designing with forecasting can predict everything. The research objectives are integrated between TVET and relations with IR 5.0. The IR 4.0 to 5.0 is changing in a short tenure and reshaping the global economy. It is going to re-shape the world's economy. ICT may lead TVET and skill planning is outlined in this publication. The study is based on the following objectives.

- To find out the current scenario of TVET and how overcome COVID-19 destruction
- To map and point out the TVET institute development and e-learning management
- To identify importance and focusing IR 4.0 to IR 5.0 revolt
- To brief TVET and IR 5.0 and its relationship with career
- To show TVET in the post pandemic and blended education process

#### **Methodology:**

For the study of TVET enhancement, the authors employed both qualitative and quantitative methods. The methods focus on addressing the research objectives. The data from the TVET experts, principals, practitioners, instructors, and employers (N = 47) was collected to address all the research questions. In addition, various journal and policy document analyses and workshops for aligning with overcoming the COVID-19 crisis and filling significant academic loss the data was collected using both quantitative and qualitative approaches by using a questionnaire. Thus, the survey employed 'Convergent Parallel Design' (Creswell, 2012). The challenges in communication during the COVID-19 situation meant it was hard to reach more people for more data. The institution categories are both government and private, proportionately.

Alongside preparing the good words, review different contemporary reports of international development agencies on TVET. Examine current publications and news articles relating to the research and TVET initiatives. Aside from that, the article emphasises Zoom webinar meetings, which are focused on observation of current news articles and TV talk shows. corresponding within TVET scholarly articles to the Google scholar website, and finally compiling reflection information and analyses with COVID-19 pandemic constraints

Carrying out the study with a statistically representative sample, the subsequent formula is used to define the sample size for a known population (Daniel, 1999):

$$n = \text{deft} \times \frac{N \times X}{X+N-1}$$

where,

$$X = \frac{Z_{\alpha/2}^2 \cdot p \cdot (1-p)}{e^2}$$

Here,

n = sample size

N = population = 47

$Z_{\alpha/2}$  = the standard normal deviate, usually set at 1.96 which corresponds to 95% confidence level

p = estimated value of the parameter; the proportion in the target population estimated to have a particular characteristic. Here the value of 'p' considered 0.5

e = error margin  $\pm 0.05$

deft = design effect = 4

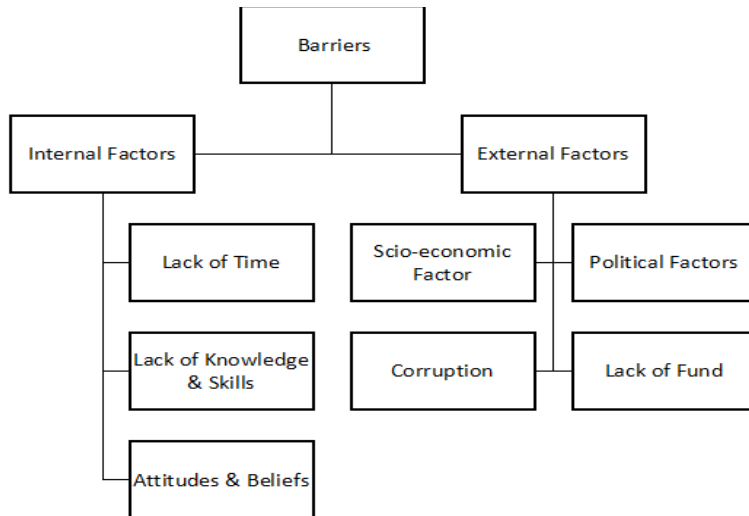
According to the sample estimation formula and selected sample of institutions, (Govt. and Private) vexed to balance consistently.

### **Problem Statement:**

TVET in Bangladesh often faces challenges in ensuring quality education. The Bangladesh Education Sector Review 2000 (The World Bank, 2017) elaborated that the main problem with skills training in the formal and non-formal sectors of TVET is a lack of linkages to employers and the job markets. Industries and job providers complain that TVET and other technical training programmes do not generate the skills as required for jobs. A lack of teacher and institutional accountability, insufficient practical mercenaries (modern and ultramodern), unsuitable content in textbooks, lack of government initiatives, inadequate professional and dysfunctional or lack of industrial attachment are identified as barriers to technical education in Bangladesh in different studies (Haolader & Paul, 2013).

### **Results and Discussion:**

Accordingly, the theory-based curriculum mismatched between the graduates' achieved competences and the competences in-use at the workplace (Haolader & Paul, 2013). However, a few studies were done which focused on the TVET SMART curriculum, mainly to develop the teaching and learning with global trends. As well, as graduates' competencies to match with the expectations of employers, TVET has been proven to meet 60 essential needs in promoting economic growth and socio-economic development (Institute of Education and Research, 2021). TVET has been continued by UNESCO as a key area in education and a key area of education. It continuously faces challenges in preparing workers with dynamic acquaintance. The TVET mechanism of a country supports youth employment as well as economic tools. The main factual grips the TVET system in promoting center to periphery, which is why they believe in general cascade. The diagram shows the barriers of TVET in Bangladesh.



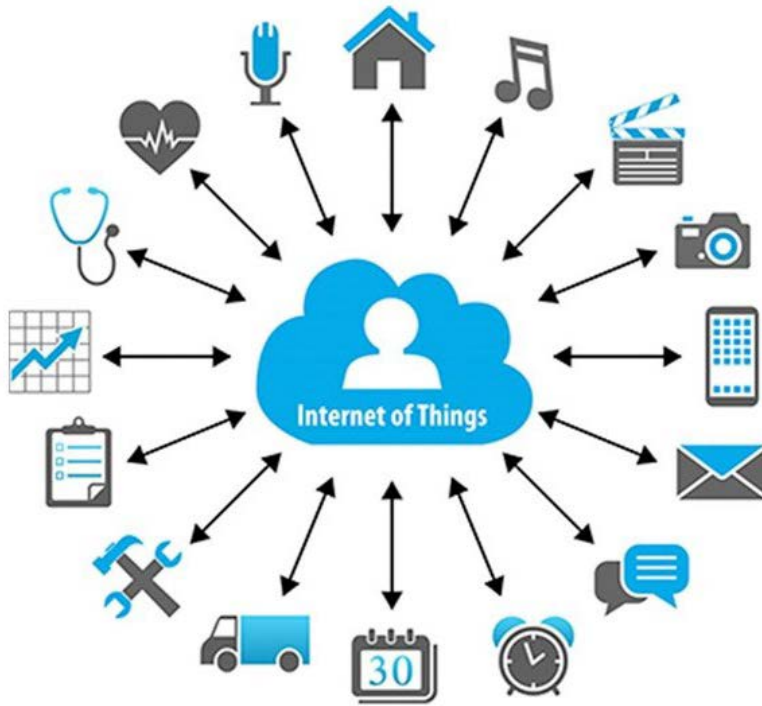
**Figure 3:** Barriers of TVET in Bangladesh

Tremendous development in the socio-economic status and technological changes are taking place globally and EduTech facilities are changing our mindset. The global consumers' expectation towards the product and scenario is always changing drastically. Thereby resulting into a highly competitive globalized market. In order to fulfill demands, organization should ensure best quality products and be serious about the choice of the customers. Every nation in the global village needs to have updated means, particularly in the area of updated knowledge and skills to survive in globalized open market. Many countries from the Asia and the Africa are facing growing pressure to complete with this challenge management.

### Challenges of TVET in Bangladesh

- Increasing the member of TVET sector available which improves more investment
- Enhancing the capacity of TVET institutions and practitioners
- Making paradigm/ program demand driven results in global context
- Provide better quality courses with credentials recognized nationality and internationally
- Promoting higher profile TVET and new qualification
- Strategies funding for skill development and the new source of funding
- Funding qualified staffs and application of automation tools
- Developing models for work placement for instructors and students
- Achieving the sustainable goals
- Establishing and strengthening the networks between industry and TVET Institutes

The above challenges inextricably linked. It is difficult to address all the issues at once but maximums. There is a shortage of capable TVET teachers in educational institutions, modernization of equipment, environment friendly and various other problems. Lack of ongoing research, funding for quality and intrauterine attachment must be consider. A model of interest for work can applied experimentally for smart TVET for the country. Tech based education promotion and make solutions as well as embrace the TVET quality promotions. EduTech can helps to mitigate TVET system lacks.



Source: <https://steemit.com/iot>

**Figure 4:** Internet of Things and IR 5.0 with smart devices

The concept of TVET to support grassroots level inclusion for promoting occupation and youth empowerment. The eradication of root problems, i.e., poverty alleviation through employment, Accelerating TVET can reap the benefits of this by imparting education at the community level. Creating entrepreneurs in the formal and informal sectors might uplift TVET graduates. It may help with community inclusion. TVET is a blessing for everyone; it creates interest and a future for novices in the field.

There is a solution to all the problems, but the employment of the unemployed is the greatest solution. All the above barriers to online TVET are able to be addressed in the teaching learning system. In the 21st century, the internet has been added to our marrow and every breath. Although instructions have to cope with this because of the rapid changing of user versions of any device. It requires modern and smart teachers who are capable of imparting thoughtful teaching to learners who are proficient in the language and usage of computers and cyber systems (Poutiainen, 2020). Moreover, we need global competency support and institutional collaboration for global TVET perspectives.

The major requirements for fulfilling virtual-based teaching pedagogy and evaluation platforms are affordable and stable internet connections, even though uninterrupted power is the barrier. However, it would have addressed the development of the TVET education system. The holistic pathways may lead and intersect with the IR 4.0, IR 5.0, and SDGs. The integration and facilitation of ICT and robotics brings the best results for the community. The contemporary urge is to set either a new or an alternative policy for the future demand for TVET equity. A tertiary action plan for institute, home, and industrial connection may solve the problem quickly.

### The SDGs is the arching prospect of TVET improvement

The year 2015, UN declared and adopted the 17 Sustainable Development Goals (SDG) as global goals with an ambitious action plan. As the UN Organization pointing in the UN website *“the SDGs are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including those related to poverty, inequality, climate change, environmental degradation, peace and justice.”* The 17 Goals all are interconnected, and in order to leave no one behind, it is important that we achieve them all by 2030. The main think of the goals eradicate poverty and connected to quality education for transforming lives. It is well known that education is the weapons of changing lives.



Source: <https://sdgs.un.org/goals>

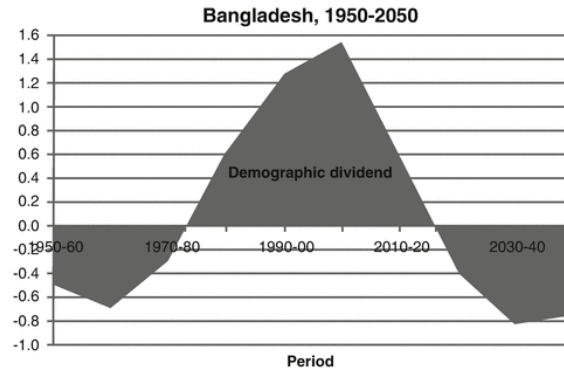
**Figure 5:** The SDG goal 4: Quality Education and Direction of Goal

TVET is facing this disruption more severely. Initial government responses appear to have been quicker in general education than TVET in different countries. Work based learning has been most affected by the pandemic, and its impact is severe in countries where it is compulsory part of the curricula. The hallmark of TVET is its focus on practical skills and work-readiness, which makes remote learning particularly challenging. Access to the internet and cyber-lounge are limited in Bangladesh. Much research has shown that inequity of gender and socioeconomic context can be exacerbated by remote learning through online platforms as a means of increasing gender empowerment. Many teachers opined that our institution is far away from upgrading facilities and global curriculums.

#### **Institutional TVET scale up and governance:**

In addition, practical skills are often acquired through learning-by-doing, which occurs in TVET aligned school-based workshops and laboratories or through hands-on experience in the workplace. Remote learning approaches are a fragile substitute for practical exercises when they require the use of equipment or materials not usually found inside the home, except for some occupations like sewing, catering, cyber security, graphic design etc. Demand and supply reach all incumbents in order to generate employable and demanding trades. By enhancing industrial revelation, TVET in Bangladesh aims to address the critical governance system in e-transitional demographic growth.





Source: <http://www.techedu.gov.bd>

**Figure 6:** e-transitional demographic growth of TVET in Bangladesh

However, work-based learning can continue with precautionary safety measures in cases where businesses remain open. Virtual internships, apprenticeships, or creating short-term alternative modular approaches for occupations that can help cope with the crisis can help. The time loss may cover the COVID-19 situation to govern the post-COVID recovery planning with integrated ICT application (Poutiainen, 2020).

#### **Learning loss due to discontinuation:**

TVET institutes have been completely closed for over 2 years due to the outbreak of COVID-19 and lockdown in Bangladesh. An elongated contract of disengagement from TVET institutes caused disruption in students' learning (Karra, 2020). The thinking and planning academics of the institutes recover and regain learning domains. The regular session may result in completing the yearly gap of the worst by the next few years.

The key of Industry Revolution (IR) 4.0 brought in digitization, which is inbuilt with inclusive technology. IR focused on all levels of business uses and impacts deliverable to consumers' applications. This digital transformation permeated the business approach with the key drivers comprising profitability, collaboration across departments, and process optimization. Thus, such large-scale transformations necessitate flexibility in work and workforce education.

#### **Disrupt industry engagement:**

The TVET is simulation supported tutoring, aligned with a great demand for industrial attachment for internship work. The purposeful learning of students affected by pandemic situations (World Health Organization). The shock will continue for a long time. It also affects the relationship between industries and research institutes. Nevertheless, industrial attachments might increase and proceed to plan at double the pace with access to jobs. The process creates more interest in novices.

#### **Strategies and Innovations:**

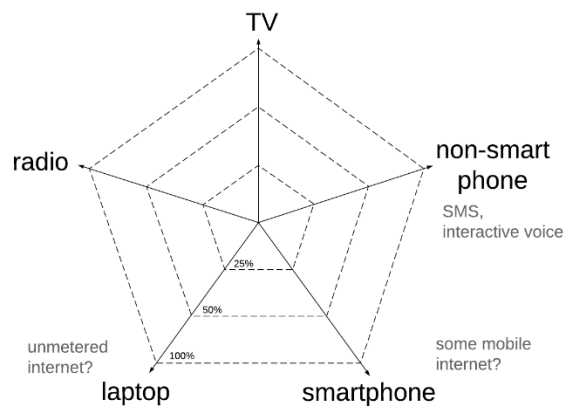
Good practice and innovation in TVET are linked to economic development strategies. The effective strategy helps training and involvement of employers in directing and evaluating the training system. A wide range of associations need employer recognition, participation, governance, and enterprise relations to build public-private partnerships (PPP).

An important lesson learnt from the pandemic is to emphasise the importance of remodelling rural zones for economic growth. National digital portals and e-services occupy the TVET management cycle with an attachment of Union Digital Center (UDC). The local assistance would be the TVET platform. Local TVET learner growth and equitable economic progress throughout the country may be facilitated by UDC. The

process has a strong network and physical establishment to scale up social TVET inclusion, employment, strengthen rural ecology, and rejuvenate village income growth. A once in a century pandemic can open up a once in a century opportunity for a young, resilient, and vibrant country like Bangladesh (Parkash, 2020).

### Blended learning:

Views of TVET experts and teachers suggest that the veiled pandemic situation is generating different suffering causes relating to total education. Afterwards, the situation blended approach allowed young people to continue their TVET courses. An upcoming resilient situation for TVET requires system alteration and upgradation. Due to the complexities of developing practical skills, horizontal course design, simulation, and compliance, TVET faces additional challenges in transitioning to online learning. Software and app-based skills are essential for ample hi-tech infrastructure to implement an inaccessible TVET platform for a global view of edu-management. The technological access of TVET requirements relates to the techno radar diagram.



Source: <https://www.google.com/imgres>

**Figure 7:** Radar diagram of expanding smart electronic devices in percentile

Most of the TVET institutes situated far from villages. The village students cannot have access to TVET courses simply. The post pandemic stage, youth group of Bangladesh called upon to contribute to rescue of broken economy by self-employment. The keyways are equipped and skill development of the potential group of people. The resilience mechanism requires contemporary managerialism evolving challenges to adapt to future disruptions. It will reflect the path out of poverty for the country as well as their family.

### Overcoming TVET challenges followings:

- Develop simulator or game for every course so that students can achieve required skills from remote
- Teachers should be trained to develop on relevant technology and virtual advancement
- Upgrade the TVET certification course for global recognition and affiliations
- Making global institutional partnership for technical training exchanges
- Identifying student learning gap assessment (LGA), plan to make-up support of the gaps and address the marginal groups
- Increased institutional facilities and establish robots based instruments and machineries

- Provide subsidized support to TVET learners industrial attachments and employment support and career coaching
- Inclusive skill readiness for IR 4.0 to 5.0 accelerating approach for automation and IoT

**Conclusion:**

The study revealed that most of the TVET technical professionals mentioned that they need modern classrooms, teaching pedagogy, and cybergang. The hopping system opportunity will create demandable skills for graduates. For the IR 4.0 to IR 5.0 spectrum, EduTech needs to get better so that finding a good job won't be as hard in the future. Apart from this, industrial attachment for TVET novices is necessary by forming industrial attachment working negotiations in different sectors. Most students in rural areas are poor, so they need help paying for their education, work experience, and career counseling.

Bangladesh is a labor-intensive market and employs over 3 million people in the manufacturing industry. With the advent of modern technologies, industries are concerned that automation will lead to increased unemployment. Therefore, falling short in the run to competing in the global markets in terms of output, productivity and efficiency. Introduction of COBOT (collaborative robots) will help boost productivity in the Bangladesh industry by ensuring minimization of downtime and upskilling of labor. Universal Robots are easy to program and install, and their collaborative nature allows them to work side-by-side with the workforce for high quality output. They work as a 'helping hand' that helps the workforce carry out monotonous tasks, increasing productivity and efficiency.

The collaborative robot is a powerful innovation in the industrial manufacturing sector, leading to IR 4.0 and traversing 5.0, enabling automated production. The streamlining of repetitive industrial processes requires skillful hands. This approach will enable production to assign employees jobs that are more creative. Perhaps, it is essential to cascade the thoughts of post corona plans for assessing learning gaps and prioritizing academic gaps. TVET will rearrange classroom settings, leading to success, social and emotional learning by mentoring and career counseling. Regaining academic footing for the disruptive coming years after a great loss and a breakup study with trauma.

Creating a flexible and integrated learning system, providing student support and addressing the ongoing digital divide would accelerate TVET and e-learning management systems and overcome current destruction. Hybrid mode of learning and in persons of learning even though student engagement has to unveiling the gaps towards a new normal teaching learning ecosystem. The post-pandemic perspective with the friendly connectivity of virtually supported TVET procedures recovers an unbelievable great loss. Improving e supported TVET is to promote transforming skills and an employable world. Mitigating the challenges and adding values, the urge is to plan a robotic TVET environment, subsidized training for efficiency and productivity in an affordable manner. Scholastic and insightful management mostly address the TVET demands of tech-manpower and automation valley.

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**Conflict of Interest:**

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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