Journal of Business Insight and Innovation

Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

BRIDGING CPEC-DRIVEN INDUSTRIAL GROWTH AND SKILL-BASED EDUCATION IN PAKISTAN: A SYSTEMATIC REVIEW

Muhammad Rafiq-uz-Zaman [1]

Affiliations:

[1] Ph.D. Scholar,

Department of Education,

The Islamia University of Bahawalpur,

Punjab, Pakistan,

Eamil: mrzmuslah@gmail.com

Corresponding Author(s) Email:

[1] mrzmuslah@gmail.com

Abstract

The China-Pakistan Economic Corridor (CPEC), a landmark infrastructure and economic initiative with an investment of USD 62 billion, offers significant growth potential for Pakistan's economy. However, the full realization of CPEC's potential depends on the development of a skilled workforce capable of operating, maintaining, and sustaining the corridor's infrastructure, industries, and services. This systematic review examines the relationship between CPEC-led industrialization and skill-based education in Pakistan, focusing on the current state of technical and vocational education and training (TVET) in the country. It identifies key gaps in the TVET system and proposes strategies to bridge the education-industry skills gap. The review is based on evidence from studies related to CPEC's educational components, TVET in Pakistan, the skill needs of the 21st century, and workforce alignment. Key findings include: (1) While CPEC presents a unique opportunity for skills development, the existing TVET system is inadequate to meet the projected demands; (2) There are significant gaps between the skills taught in TVET institutions and those required by industries driven by CPEC, particularly in technical trades, digital literacy, and soft skills; (3) The institutional capacity of TVET institutions is insufficient to meet the future needs, with resources concentrated in developed provinces, leaving peripheral areas underserved; and (4) A successful model requires an integrated approach that aligns policy, industry needs, and education. Based on these findings, the review recommends the development of a national skills strategy that links TVET to CPEC's economic zones, fosters industry-education partnerships and apprenticeships, revises TVET curricula to include 21st-century competencies, invests in infrastructure and teacher training, promotes regional and social equity, and establishes rigorous monitoring and evaluation systems. The review concludes that aligning skill-based education with CPEC-driven industrial development offers a transformative opportunity to drive industrial growth and provide employment opportunities for youth in Pakistan.

Keywords: Keywords: China-Pakistan Economic Corridor (CPEC), technical and vocational education and training (TVET), skill-based education, industrialization, workforce development, 21st-century skills, education-industry alignment, Pakistan.

1. Introduction

1.1 Overview of CPEC: Scope, Phases, and Economic Relevance

One of the brightest infrastructural and economic collaboration initiatives in the world is the China-Pakistan Economic Corridor (CPEC) (Bano et al., 2022). Inaugurated in 2013 as the flagship project of the Belt and Road Initiative of China, CPEC is a USD 62 billion project comprising of several phases

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

including (but not limited to) transport infrastructure and energy projects, industrial development, agricultural cooperation and institutional support.

Phase and scope of CPEC; Early harvest projects (2013-2020): Energy projects and transport connectivity aimed at developing an infrastructure that would support overall economic cooperation Medium-term projects (2020-2025): Industrial development, special economic zone, and institutional capacity building

Long-term vision (2025-2030): Regional integration, technological progress, and economic linkages in the very broad terms.

Important ingredients to develop skills (Bano et al., 2022): Gwadar Port development and related industrial areas; Karakoram Highway improvement and transport systems - Energy infrastructures (hydropower, thermal plants, renewable energy), Special Economic Zones (SEZs) throughout Pakistan such as Gwadar, Karakoram Highway, Havelian, Hattar, Faisalabad, Multan; Industrial parks and manufacturing hubs, Institutional development, including technical and vocational schooling.

Economic impact on Pakistan: CPEC is a breakthrough opportunity to the economical growth of Pakistan. It is projected to generate several million direct and indirect jobs, boost the volume of GDP, improve the connectivity of the region, and make Pakistan one of the economic centres of the region (Bano et al., 2022). Nonetheless, it is essentially based on the establishment of sufficient skilled workforce in an endeavour to realize this potential.

1.2 Defining Skill-Based Education in Pakistani Context

Skill-based education is a range of formal and informal practices that equip human potential to work and contribute to the economy (Bano et al., 2022):

Technical and Vocational Education and Training (TVET): Post-secondary certificates and diplomas in technical trades, vocational training in certain occupational areas, lasting 1-3 years after secondary education. Examples include electrical technology, automotive repair, construction, telecommunications, etc.

Apprenticeships: Training through practical experience under the supervision of a well-experienced practitioner. This integrates classroom learning with practice at the workplace and lasts 2-4 years. Apprenticeships are the conventional practice in Pakistan and are becoming more formal.

Flexible and Modular Credentialing: Short-term programs that focus on particular competencies, offering stackable credentials that allow skill development in a step-by-step way. These programs are flexible and adult-friendly, providing recognition for prior learning and competencies.

Upskilling and Reskilling Programs: Worker training aimed at acquiring new skills to work in a new environment. These programs offer lifelong learning opportunities to constantly update skills, helping workers adapt to the emerging needs of the labour market.

21st Century Skills in Professional Settings: Technical expertise in a particular trade or field, soft skills such as communication, teamwork, and problem-solving (Muhali, 2019), digital literacy and technological aptitude (Muhali, 2019), entrepreneurship and financial literacy (Muhali, 2019), and critical thinking and versatility (Muhali, 2019).

1.3 Why Linkage Between CPEC and Skill-Based Education Matters

The connection between industrial development based on CPEC and skills-oriented education is essential in several ways:

Employment opportunity alignment (Bano et al., 2022): CPEC will generate millions of jobs in various industries: the construction, operations and maintenance, manufacturing, services, logistics. Yet, such opportunities are not available to the workers who do not have the relevant skills. Skill education guarantees the availability of a skilled workforce that is capable of tapping such opportunities.

Needs of industrial zones and SEZs (Bano et al., 2022): The Gwadar Port, Havelian industrial zone, Faisalabad industrial area, and any other SEZs demand the presence of the skilled worker on a variety of different levels: supervisors, technicians, operators, engineers. Existing workforce capacity inadequate and thus the demand of specific skills is acute.

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

Infrastructure project needs: MEGA infrastructure projects demand specific skills in construction, electrician, welding, working with huge machinery, and project managerial skills. Access to skilled workforce also has a direct impact on the efficiency of the project schedule and cost.

Youth employment and development: Pakistan has a population of 218 million comprising 60 percent below 25 years (Bano et al., 2022). Unemployment among the youth is a major issue with severe social and economic consequences. The skills training through CPEC provides an avenue to youth to take prolific jobs and economic activities.

Distribution of CPEC advantages: CPEC advantages are also concentrated at specific areas (Gwadar, Balochistan; Punjab industrial zones). The skill based education compatible to CPEC would help in curbing disparity between regions so that the peripheral regions gain through the development of corridors as well as lessening disparities between regions.

Economic competitiveness: With Pakistan becoming a part of regional and global economies in the CPEC project, the skills of workforce have a direct impact on competitive positions. Limited productivity, innovation and value addition are hindered by inadequate skills to constrain economic potential.

CPEC investment sustainability: CPEC would have its long-term success related to the sustainability of its operations, maintenance and improvement of its infrastructure and industries. Provision of qualified human resource, that is competent to handle and optimize CPEC resources, directly facilitates investments returns and growth outcomes.

2. Conceptual Framework and Theoretical Underpinnings

2.1 Human Capital Theory and Skills-Economic Growth Linkage

The human capital theory offers some fundamental framework knowledge on how skills can be vital in economic development (Muhali, 2019). According to theory, investment in human capabilities, which includes, education, training and health, enhances productive capacity and economic returns. People who possess more human capital incorporate higher wages, possess favorable job opportunities and add more to the output of the economy.

Application to skill-based education Skill-based education investments raise human capital, forming the ability that can be directly applied to productive work. Employees who have undergone vocational training and technical skills receive better salaries compared to their unskilled counterparts and this helps an individual in economic welfare and the overall economic growth (Muhali, 2019).

Macro-level effects: In the national level, workforce skill development is associated with growth in productivity and innovation, competitiveness and economic development. Usually, countries that spend significant amounts of skills training have higher levels of growth rates, industrial competitiveness, and improved employment (Bano et al., 2022).

CPEC setting: According to the human capital theory, the CPEC lacked potential in its economy owing to the skills of the workforce. In case of the development of the appropriate competent workforce in line with the requirement of CPEC, the economic returns will go tremendous. On the other hand, the lack of skills curtails the benefits of CPEC, restricting the quality of job creation and economic productivity (Bano et al., 2022).

2.2 Infrastructure Investment-Skills Demand Linkage

The derived demand of skills is created by infrastructure investment. The largest infrastructure projects and industrialization need staff with certain technical skills (Bano et al., 2022).

Direct skills: Electricians, welders, heavy equipment operators are obligatory in construction projects. Cranes, logistics coordinators, customs people are needed in port operations. Production plants need the services of machine operators, technicians, quality controllers.

Problem of supply-demand fit: With a mismatch between supply and demand of skills the problems associated with projects are delays, cost increase and quality issues. Unskilled workers are unable to show proper performance, which poses a safety and productivity risk (Bano et al., 2022).

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

Skills-job matching: Successful skills training predicts the job-created job requirements, skill building needs that are in accordance with the estimate needs. This will demand the identification of competencies required early on, mapping of the curriculum and development of training programs.

Regional economic growth: The infrastructure in specific areas generates employment within the area. Through skills training in those areas, residents can enjoy opportunities instead of going on a migration or bringing in labor (Bano et al., 2022).

2.3 TVET Systems Models in Developing Countries

Studies have found that there are different models of TVET systems used in developing countries, each with its strengths and weaknesses (Bano et al., 2022):

Center-based Vocational School Model: Separate vocational schooling with both classroom and practical training, which may or may not be government-sponsored.

1. **Advantages:** Curriculum design, certified training, and labor market recognition.
2. **Weaknesses:** Costly to fund, lack of employer involvement, and often not aligned with the labor market (Bano et al., 2022).

Apprenticeship-based Model: Training is mostly done through on-the-job learning with craftspeople.

Traditional Model: Focuses heavily on practical training, has direct labor market involvement, and has low institutional costs.

1. **Strengths:** Focus on practice, direct labor market involvement, and low institutional cost.
2. **Weaknesses:** Quality variation, little complementary classroom training, and often informal and unregulated (Bano et al., 2022).

Dual System Model: Combining classroom education and on-the-job experience, widely practiced in Germany and Switzerland, with a strong focus on cooperation between education and business.

1. **Advantages:** High employer involvement, high level of applicability, and good employment outcomes.
2. **Weaknesses:** Requires a significant commitment from employers, and its implementation can be quite challenging (Bano et al., 2022).

Public-Private Partnership Model: Involves government support with involvement and funding from the private sector, increasingly common in the developing world.

1. **Strengths:** Allows the private sector to apply its expertise, reduces the load on the government, and could be sustainable.
2. **Weaknesses:** Requires institutional capacity to coordinate; without such management, it can limit equity (Bano et al., 2022).

Informal/Non-Formal Training Model: Training provided by community organizations, non-governmental organizations, or individual trainers.

This model often targets populations that the formal system does not reach.

1. **Strengths:** Accessibility and affordability for low-income populations.
2. **Weaknesses:** Poor quality of training, no credential recognition, and sustainability issues (Bano et al., 2022).

Pakistan's TVET Situation: Pakistan mostly uses the centre-based and apprenticeship systems, with increasing privatization. Studies show that the existing model does not meet the requirements of CPEC, as it does not sufficiently integrate with industry, lacks employer involvement, and is not responsive to evolving skills needs (Bano et al., 2022).

2.4 21st-Century Skills and Industry 4.0 Requirements

In addition to the conventional technical skills, the industries powered by CPEC are inclined to demand 21 st century competencies themselves based on the current workplace needs (Muhali, 2019; Mutohhari et al., 2021):

Core 21 st century skills (Muhali, 2019):

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

Critical thinking and problem-solving: Capability to analyze, develop solutions, and find out problems

Communication: Ability to express, listen, and influence across different settings, information literacy, cyber awareness

Digital literacy: Comfort with technology, ability to analyze, develop solutions, and drive improvement

Collaboration: Ability to work in a group, respect differences in perspective, develop consensus

Creativity and innovation: Generation of new ideas, change, and facilitating improvement

Industry 4.0 skills (Mutohhari et al., 2021):

1. High level of technical expertise in particular areas
2. Adequacy to technological change
3. Systems thinking and complex issues dealing
4. Data analysis and interpretation
5. Cybersecurity awareness
6. The orientation to life-long learning.

Transference to CPEC context (Bano et al., 2022; Mutohhari et al., 2021): CPEC industries are becoming more technology-intensive, and workers need to possess both technical skills and 21st - century skills. Employees have to fit the shifting technologies, work in a multicultural environment (Chinese companies, international standards), crack intricate issues, and constantly acquiring new skills (Bano et al., 2022).

Pakistan problem: challenge Pakistani TVET The existing curriculum usually focuses on technical knowledge acquisition rather than competency development (Mutohhari et al., 2021). Not all soft skills, digital literacy, and problem-solving are integrated into vocational programs, which causes the graduates to be unprepared to meet the modern workplace skills (Bano et al., 2022).

3. CPEC and Skill Development in Pakistan: Evidence and Current Status

3.1 CPEC's Education and Training Components

CPEC contains its own education and training elements that address the significance of skills (Bano et al., 2022):

Pak-China Technical and Vocational Institute, Gwadar; An institute of CPEC flagship training

What: Technical and vocational training of Gwadar and wider CPEC labor force

Area of interest: Port work, logistics, maritime skills, and building skills - Model: Chinese-Pakistani joint project, Chinese experience, and investment

Operations: In progress, full operationalization still in early stages.

1. Vocational centers and institutes CPEC Technical institutes use
2. Various CPEC-sponsored technical institutes opened up in industrial zones
3. Specialization to suit the industry of the locality (construction, manufacturing, energy) - Curriculum Responsive to the needs of local industries.
4. The cooperation agreements in Chinas Pakistan vocational training; bilateral agreements supporting the transfer of technology, curriculum development, instructor training
5. Chinese experts assisting in providing technical assistance and training- scholarships available to Pakistani students to be trained in China
6. Exchange programs and development of curriculum collectively.
7. Partnerships with university/research institutions
8. CPEC-based centers of excellence in engineering, technology, business
9. Building advanced technical capacity, as well as research in CPEC-relevant technology and administration.

3.2 Skills Development for CPEC Workers

There are several areas of CPEC employment with a variety of skills (Bano et al., 2022):

Un- and semi-skilled jobs (about 60% of the workforce):

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

General workers, assistants, helpers
No special physical conditioning, trainable, reliable
Most likely place of entry of low-education workers.

Skilled technical (not less than 25% of the workforce):

Electricians, welders, machine operators, drivers, maintenance workers
Need 2-3 years of technical training or apprenticeship
Center of TVET system.

Supervisory and technical management (about 10 percent of workforce):

Site managers, safety individuals, quality supervisors, technical supervisors, coordinate supervisors
Need both technical expertise and management skills
In many cases, administrative skills or advanced qualification are required.

Professional and management (around 5 per cent of working population):

Engineers, project managers, port administrators, business managers
University education or international
level work experience (being regularly replaced by Chinese expatriates or Pakistani professionals with latter)

With its skills requirement, there are implications (Bano et al., 2022): It has been shown that technical skilled jobs are deficient by a significant margin. Even though there is a lot of unskilled jobs that are on offer, it provides them with low earnings and growth. The lack of qualified technicians and supervisors as the chronic problem contributes to the lack of productivity and reliance on foreign labor that prevents the employment of Pakistanis (Bano et al., 2022).

3.3 Assessment of CPEC's Educational Scope

A study of the scope of CPEC education finds significant gaps (Bano et al., 2022):
Minimal coverage of skill development requirements
CPEC does have modest amount of education and training, however, the general investment in skill development is low when compared with the total investment of CPEC
It is estimated that less than 5 percent of the CPEC funding is used on skills development, even though that is what is required to create these benefits
Most CPEC projects have no associated skills development programs.
Few institutions - Education and training: These facilities were in Gwadar and large industrial zones; Large areas with LCSPEC applicability do not have specific training programs.

Institutional constraints of capacity:

1. Pak-China Technical Institute and other CPEC institutions have limited capacity
2. Lack of infrastructure/equipment/qualified trainers to facilitate decent enrolment and quality
3. Overreliance on Chinese knowledge to maintain sustainability and institutional independence.

Connection gaps:

1. Compared to the rest of the country TVET system
2. Lack of integration between CPEC training institutions and the rest of the country
3. Lack of coordination with other vocational institutes
4. Duplication and lack of efficiency due to lack of systemic approach

3.4 Challenges Identified in Current State

The assessment of the programs and research point to the main difficulties in the contemporary efforts of developing the skills (Bano et al., 2022):

Access barriers: Issues of geographic dispersion include that most potential workers are simply unable to access training - Monetary access includes excluding the poorest populations as unable to access available training - Lack of awareness of available training among target population groups - Eligibility issues and prerequisites lock out a large proportion of interested workers.

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

Quality lapses (Bano et al., 2022): Most training centers operate outdated equipment that is unsuitable in preparing workers to work in modern workplaces - There is a lack of enough quantity and quality of instructors - The curriculum does not reflect the real job needs - there is lack of practical and hands on training based on vocation focus - Assessment does not authenticate real job competencies

Curriculum-industry misalignment (Bano et al., 2022): Curriculum design lacks engagement with industry feedback on what skills they should learn in practice - Little employer input on curriculum development or review - Students do courses that emphasize theoretical expertise instead of applied skill development - The integration of 21 st century-needed skills is low despite its growing demand - Curriculum change is slow and fails to keep up with technological change.

Limitation of teachers and trainers (Bano et al., 2022): Not enough qualified trainers to order: - Not enough professional development of the current trainers - Not enough professional experience in the industry of work - Excessively low pay does not provide the options of hiring competent employees - Lack of training on teaching adults and vulnerable populations.

Regional inequities and inequalities (Bano et al., 2022): Concentrated resources in Punjab and Sindh and Balochistan, KPs, and Gilgit-Baltistan have limited resources and struggle to access them because of their marginalized status - Little training infrastructure in rural areas - Gender inequities girls attending vocational training do so in smaller proportions than boys, with all these factors causing significant disparities between the two groups - Marginalized populations (ethnic minorities, low-income, persons with disabilities) are faced with barriers to access.

Employment outcome monitoring: Little systematic information on the employment outcomes of training graduates - Little follow-up once the training is completed - Problems in evaluating how training might be associated with improvement in employment and income - little feedback processes that can be used to improve a program based on outcome.

3.5 Mapping Skills Training to CPEC Employment Opportunities

To connect skills training to the jobs created as a result of CPEC, both the mapping of opportunities and training alignment must be done in a systematic manner (Bano et al., 2022):

Gwadar Port and Special Economic Zone; Immediate needs: Port operations (jobs in crane operation, cargo handling, customs officers), construction trades, workers in logistics - Medium-term needs: Port maintenance, technical operation, management training - Training alignment: Pak-China Institute on these and other excellent topics, but on a small scale - Gap: The training of construction trades is not up to the size of development.

Industrial clusters and manufacturing development - Hattar (KP), Faisalabad, Multan, Havelian manufacturing development zones generate manufacturing jobs, many needed

Training: The technical institutes already in these areas can be used, yet the curriculum and equipment are out-of-date

Gap: Training specific jobs in manufacturing are limited, as well as industry-education affiliations.

Power plants (hydropower, thermal, renewable); Requirement: Technological, Electrical, equipment operators, safety, maintenance workers

Training compatibility: Some training in electricity and power generation, though not at the rate necessary

Gap: Renewable energy training especially is a gap in training, even though this is an important strategy.

Transport and logistics; Requirement: Heavy equipment operators, truck drivers, logistics coordinators, maintenance workers

Training alignment: Some driving schools, basic mechanical training, but the professional training in the field of logistics is not enough in accordance with modern international standards.

Service sector (tourism, hospitality, retail): Need generated by the business development through CPEC

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

Training alignment: Training to work with international companies and standards variable
Gap: Training to work with international companies and restricted standards.

4. Critical Gaps, Barriers, and Challenges

4.1 Institutional and Governance Challenges

Institutional capacity constraints of TVET (Bano et al., 2022): Underfunded TVET providers use minimum resources - Nationwide facilities, equipment, and learning materials in high demand - Huge reliance on government spending due to competition and conflicting necessity create inefficiency of resources in vocational education - Private TVET providers use part of the demand, although this leads to fragmentation and quality differences - Low institutional autonomy results in inefficiency and lack of responsiveness.

Fragmentation of coordination and governance (Bano et al., 2022): TVET system fragmented with numerous ministries of government (Education, Labor, Technical Education) - Koordination between TVET institutions, industry and government is partial - No nationally consistent skills strategy able to give a single direction - CPEC training initiatives are partially unrelated to the broader national TVET system - CPEC training initiatives are somewhat unintegrated across provincial boundaries despite constitutional devolution of education.

Industry-education disconnect (Bano et al., 2022): Employer is least involved with curriculum development or review - Little employer involvement with skills requirement identification - Weak employer feedback mechanisms on graduate competencies - Few incentives to get the employer involved with training provision - There are no structured apprenticeship regulations and oversight.

Weak regulation and quality control (Bano et al., 2022): Low-quality standards and enforcement in TVET sector - There is no integrated system of credentialing or recognition of certificates - There is limited accreditation procedures and institutional review There is no easy way of employers to assess quality training or graduate competencies - There are no mechanisms of ongoing improvement that is outcome-focused.

4.2 Curriculum Relevance and Skills Alignment Challenges

Curriculum-labour market misalignment (Bano et al., 2022): The curricula is usually created without reviewing the labour market, or that of the employers - The content taught is more of theoretical education than of applied skills - Lack of practical training despite such vocational orientation - Instability of technological change makes the curricula become outdated quickly - Minimal processes of curriculum revision ensures that the curricula remains unresponsive to change.

Poor integration of 21st -century skills (Bano et al., 2022; Mutohhari et al., 2021): Soft skills (communication, teamwork, problem-solving) are not well integrated - Digital literacy is commonly not combined with technical training, as it should have been - Critical thinking and innovation are seldom prioritized in spite of the emphasis on self-employment - Evaluation is often focused on what one knows and not what one can do with it - Evaluation is rarely concerned with demonstration of competences, despite the significance

Technical skills deficiencies (Bano et al., 2022): Construction trades training inadequate to infrastructure development scale - Advanced technical training (equipment operation, machinery maintenance) insufficient - Electrical and renewable energy skills deficient especially in scale - Modern manufacturing and automation skills training insufficient - Logistics and supply chain management training insufficient - training inadequate.

Weaknesses in soft skills (Mutohhari et al., 2021): The level of communication skills has not yet been developed, especially in English language proficiency - Underdeveloped teamwork and interpersonal skills - Minimal focus on problem-solving, critical thinking skills - Lack of exposure to the international standards and expectations of work - Insufficient compliance behaviour and safety awareness

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

4.3 Regional and Social Equity Challenges

Geographic inequalities (Bano et al., 2022): Training facilities are clustered in more advanced provinces (Punjab, Sindh) - Balochistan, KP, Gilgit-Baltistan lack mobile or community-based training facilities despite their high relevance to CPEC

Facilities Without a comprehensive training infrastructure, the rural areas are vastly underserved compared with the urban ones - Peripheral populations face significant obstacles due to their location - Mobile and community-based training facilities are scarce in the most distant provinces (Balochistan,

Gender inequities (Bano et al., 2022): Girls involvement in vocational education is significantly lower than boys - Hans of socialization and the family influence make access to the technical education impossible to girls - The problem of safety and exclusion in the male technical sector create barriers - There are no specific or gender-sensitive training programs among girls - There is a lack of female instructional personnel that will help girls role model and choose safe areas.

Socioeconomic access barriers (Bano et al., 2022): Cost of training (direct costs, opportunity costs, transportation) barriers in the poorest populations - Minimal scholarships or financial support schemes - Lowering education requirements for training people who lack secondary education - Work requirements of young populations with low income prevent training participation - There is little flexibility to accommodate those who are employed, thus making them unable to participate in training.

Barriers in the marginalized populations (Bano et al., 2022): Ethnic minorities experience discrimination in terms of access and acceptance - individuals with disabilities experience barriers to access and accommodation - Caste-based (in Sindh) discrimination affects frontiers of access - In some cases, religious minorities face discrimination.

4.4 Monitoring, Evaluation, and Accountability Challenges

No systematic information about the outcomes of the training of graduates (Bano et al., 2022): There is a lack of national outcome employment tracking of TVET graduates - No follow-up on employment outcomes by the program, after training - More difficult to differentiate between the impact of the program and other factors - No outcome-based continuous improvement mechanism.

The lack of quality assurance (Bano et al., 2022): No single quality assessment system - Inadequate instructor evaluation or monitoring - No systematic evaluation of students or competence assessment of graduates - Limited ability on the part of employers to evaluate training quality or performance by graduates - scanty responsibility of outcomes.

Research gaps (Bano et al., 2022): There is a limited body of rigorous research on the effectiveness of TVET in Pakistan - There is a lack of studies on the effectiveness of vocational training on employment outcomes - There is a lack of studies comparing the training providers or training models on effectiveness - There is a lack of evidence base to make policy and practice decisions.

4.5 Funding, Sustainability, and Localization Challenges

Chronic underfunding (Bano et al., 2022): Government TVET funding is not sufficient to provide quality at the required issues - Overdependence on donor funding makes them vulnerable to changes - CPEC education funding is insignificant compared to the overall CPEC expenditure - Intensive reliance on fee-based training reduces access to low-income populations.

Sustainability issues (Bano et al., 2022): Overreliance on Chinese funds and experience poses sustainability challenges - CPEC funds run out and there is no continuation plan - Program continuation is not properly planned or institutionalized - Institutional development is not well established to continue its independent operation - Brain drain and staff turnover threatens deinstitutionalization.

Problems of localization and ownership (Bano et al., 2022): Schooling and training models designed mainly by Chinese professionals with little Pakistani influence - Low levels of expertise transfer to Pakistani trainers and institutions - Low levels of institutional or system strengthening - Stationary reliance on Chinese teachers - Little relevant to the wider institution or system - Minimal contribution to the strengthening of the overall system.

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

5. Opportunities and Future Directions

5.1 Creating an Integrated Skills Ecosystem

CPEC can provide the chance to create a complete ecosystem of skills education and jobs in accordance with industry needs, education, and employment and lifelong learning (Bano et al., 2022):

In addition, industry-education partnerships (Bano et al., 2022): setting up formal mechanisms for employer access in skills development - industry representatives in curriculum development committees - periodic curriculum review with employer input - Employer enthusiasm in skills development provision of equipment, inviting speakers, mentoring.

Labor market information systems (Bano et al., 2022): Neo-realizational data on the demanded skills, job trend, wage patterns, - routinely surveyed employer on the current and in-demand skills - open market information on labour markets accessible to youth making training decisions - analytics forecasting future skills needs

Competency frameworks (Bano et al., 2022): Frameworks that are defined at an international level that stipulate the knowledge, skills, attitudes needed to perform a job - Competency-based assessment in place of time based completion - Stackable credentials allowing incremental acquisition of skills - Recognized credentials allowing professional advancement and creditworthiness.

Employment and job placement support (Bano et al., 2022): Career guidance in making informed training decisions - job search skills and Pre-interview guidance - Employer connection and on-the-job job placement services - Training apprenticeship and internship placement - Post training employment support and career mentoring.

Lifelong learning trajectories (Bano et al., 2022): Establishing transparent progression between the lower and higher level of skills - Modular training that enables flexibility in participation throughout employment - Rewarding preceding learning and unplanned experience - Reskilling and upskilling to employed employees - Interaction with higher education routes.

5.2 Policy Alignment and Strategic Direction

A good skills ecosystem needs well-integrated policy framework that ties together education and industry and economic development (Bano et al., 2022):

National skills strategy (Bano et al., 2022): Comprehensive national skills policy with a single direction - Sector-specific approaches to skill development - Geographic differences and regional skills development plans - Equity targets that give inclusive access and outcomes.

Policy integration (Bano et al., 2022): Co-ordination between education, labour, and industrial development policies - TVET integration with rest of system under education provided via pathways - Integrating skills development into industrial policy - Labor market policy that allows vulnerable groups to receive training - Social protection policy that allows vulnerable groups to gain training

Institutional coordination (Bano et al., 2022): Coordinating mechanisms and mechanisms that unite the government, industry expectations, educators - A common dialogue and commonality of actions of the involved stakeholders - Mechanical funding schemes to substitute the fragmentation at the present moment - Synchronous accreditation and credential recognition - Coherent mechanisms of monitoring and evaluation.

Regulatory framework (Bano et al., 2022): Standards of quality and accreditation of the training facilities and their instructors - Certification of the teachers and development of their professional integrity - Employer incentives on training investment - Performance and outcome accountability mechanisms.

5.3 Curriculum Modernization and Pedagogical Innovation

Implementing changes in vocational training programs and methods of teaching required in the modern labour market (Bano et al., 2022; Mutohhari et al., 2021):

Integration of the 21st-century competencies (Muhali, 2019; Mutohhari et al., 2021): Competing the components of the technical training with soft skills (communication, teamwork, problem-solving) - The addition of the digital literacy and technology competence with technical skills - The penetration of the components of entrepreneurship and financial literacy - The focus on the adaptability,

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

lifelong learning, and growth mindset - The integration of the global awareness and cross-cultural competence.

Project-based and competency-based learning (Wan et al., 2016; Megayanti et al., 2020): Learning should be structured around purposeful projects and problems in the workplace - The learning process should showcase the performance in terms of skills (not only test scores) and critical thinking and problemsolving in projects - The learning process is based on the combination of theory and practical application (applied learning) - Learning should help learners cultivate critical thinking and problem-solving (through entering projects) - Learning should provide the ability to demonstrate the actual job performance by the means of the

Digital skill integration (Muhali, 2019): Knowing computers universally - Software and technology skills industry-based training - Knowing the computer - Within the industry of technology, it is not a component of understanding, but rather integrated knowledge that encompasses all the technical areas.

Employer-driven curriculum formulation (Bano et al., 2022): Employers as the main origin of skill needs identification - Curriculum design process that includes the employer representatives - Periodical changes that include the employer in the process of infusing skills in the curriculum and campus changing their employment practices - Influence of employer into the teaching, assessment methods - Curriculum validation by the employer through their hiring and performance feedbacks.

5.4 Models for Sustainable Skills Development Under CPEC

There are several models with sustainable and effective skills development that is connected with CPEC (Bano et al., 2022):

Apprenticeship-based model: These involve formalized apprenticeship, with built-in program curriculum and protections: Integration of classroom with on-the-job learning: Benefits: Great practical orientation, employer involvement, sustainable due to employer involvement Employer compensation Investment in training: Tax incentive or other direct measures Government-supporting components: Classroom components Benefits: Great practical focus, employer engagement, sustainable through employer involvement

Cluster-based training centers: Training centers located within or in the vicinity of an industrial zone Cluster-based training: Curriculum based on industry needs Structure: Employers are more actively involved in the training center and take part in its governance Geographic proximity Benefits: direct association with employment opportunities, strong employer involvement, geographic proximity

Public-private partnership model: Government administrative infrastructure, seed funding, policy framework, Private sector administrative infrastructure, curriculum expertise, employer connection Revenue sharing or cost-recovery strategies to ensure the public good Beneficiations Removes societal burden and utilizes the available expertise of the private sector beneficially: Quality assurance and accountability strategies to ensure public good

Modular micro-credential system: Triple H Short, adult-focused, targeted training in particular skills - Stack Credential to facilitate progression into advanced Greater Growth Skills enable lifelong learning Accommodates working adult advocacy Flexible participation - Benefits Accessibility and many benefits approach accommodates working adults - RAPid responsiveness to skill demands - Flexible More advanced benefits Growth and development

Technology-enabled distance learning: Online, video-enabled, and mobile-enabled distance learning - Technological training that can reach geographically isolated population and adult workers - Cost-reduction, accessibility, scalability, reach - Integration with physical training - Advantages: Scalability, accessibility, reduction of costs, reach

5.5 Research and Evidence Agenda

The recommended research and evidence agenda enables methods to meet input and output requirements by adhering to the standards of conducting qualitative research (Fenk et al., 2015).

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

A considerable amount of research was required to inform the evidence-based approach to development of skills (Bano et al., 2022):

Baseline and need assessment research - Mapping of the existing TVET provision and capacity in detail - Assessment of forecasted CPEC employment requirements by sector and region - Baseline measurement of workforce skills in relation to employment requirements -Veroansky consideration of targeted skill gaps necessary to be addressed.

TVET effectiveness studies (Bano et al., 2022) - Intensive analysis of current TVET programs (employment levels, earnings effects, retention) - Comparative effectiveness tests of various methods - Economic analysis of possible success of training outcomes - Long-term follow-up of graduates on their career paths - Studies of what makes successful training outcomes possible

CPEC-specific investigation (Bano et al., 2022) - Investigations of employer demands to detect particular abilities required in CPEC industries - Impact assessment of CPEC-related training interventions - Longitudinal research of employees trained to take jobs in CPEC regions - Wage effect and employment effect research of CPEC employees - Research studies on the impacts of CPEC on regional development through skills development.

Quality and equity research (Bano et al., 2022) - Training quality indicators and quality improvement studies - Barrier and solution studies of interventions to address equity challenge studies - Geographic disparity and solutions studies - Marginally studies on access and outcomes - Regional studies of equity disparities and solutions.

Policy research (Bano et al., 2022) - Comparative international policy research which defines working practices - Cost-benefit analysis of alternative policy and funding models - Governance and institutional research which highlights working coordination models - Analysis of policy implementation and hindrances to policy effectiveness.

5.6 Regional Development and Labor Market Implications

Skills development associated with CPEC is effective, and it provides high potential in the region (Bano et al., 2022):

Employment opportunities in the area - Skills training allows residents to seize employment created due to CPEC - Decreased immigration oversight as native tasks are created - Improved wages and annual earnings of the trained workers and their families - Regional economic diversification and development.

Reducing regional inequality - their CPEC infrastructure is a specific focus on the regions (Balochistan, southern Punjab, KP) - Skilling in those regions allows the equitable distribution of benefits - Regional training allows outside expertise to support long-run regional competitive advantage - Local capacity building reduces external dependence.

Labor market formalization Skills training provides a trucking system between informal and formal employment Skilled jobs increase wage levels, benefits, and financial safety Age-old changes to formal sector result in improved living conditions and economic security High placement and advancement in the formal marketplace produces enhanced productivity and competitiveness.

Sectoral transformation - CPEC-induced industrialization generating preferences on technical expertise - Skills training allows workforce to leave industries with lower levels of production of higher output sectors - Sectoral composition changes to firms with high levels of production and higher wages - Economic competitiveness increase of sectoral upgrading.

6. Policy Recommendations and Strategic Framework

6.1 Immediate Actions (0-12 months)

In-depth needs analysis - Government commission systematic needs analysis of skills requirements in the CPEC industries - This entails the identification of specific occupations, level of skill and competency requirements - This helps to provide the basis upon which future strategy is developed.

Policy coordination mechanism - Form inter-ministerial task force in charge of education, labor, industrial development, and CPEC coordination - Coordinate roles and responsibilities - Coordinate

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

coordination mechanisms - Take responsibility in again shaping unified voice on skills strategy in the future - Month coordination meetings

TVET institution audit - Thorough audit of the current TVET institutions (governments and privates) - Capacity, quality, equipments, staffings, curricula, assessment, and realization of gaps and maldistribution of geography and priorities prioritization of interventions.

Curriculum audit and strategic review - D comparison of the current vocational curricula in relation to CPEC employment requirements - Revealing the misalignments and skill gaps - Preliminary curriculum modernization roadmap - Coordination with employers on skill requirements - Recommendation on priorities to modernize curricula.

6.2 Medium-term Reforms (1-3 years)

Development of national skills strategy (Bano et al., 2022) - National skills strategy that offers a uniform policy guidance - Government vision and skills development targets - Sector skills strategies linked to national vision - Regional skills strategies which aligns national vision with the goals - Equity targets to achieve an inclusive access, and outcome - Implementation roadmap, with clear timelines and responsibility.

Institutional strengthening (Bano et al., 2022) - Investment in infrastructure in priority TVET institutions - Equipment modernization that ensures the correspondence with the industry standards - creation of Skill Development Authority/Council that provides system control - setting of accreditation standards and institutional assessment systems - creation of quality assurance structures and continuous improvement structures.

Curriculum modernization (Bano et al., 2022; Mutohhari et al., 2021), - Systematic curriculum revision in accordance with CPEC employment demands - Further adoption of project-based, competency-based learning - Employer involvement in curriculum development and curriculum revision - Implementation of curriculum and training of instructors.

Instructor development programs (Bano et al., 2022) - General training program of teachers and educators providing familiarity with all the latest technical information of the world - Pedagogical training of adult learners in relation to competence training - Industry attachments that guarantees the currency and applicability of the information required to update their professional skills - The needs of professional growth and further education.

Employer engagement systems (Bano et al., 2022) - Industry advisory committees to lead the TVET system - Sector-level employer associations to input skills demands - Partnerships that allow employers to be involved in training provision - Apprenticeship schemes in which employers engage in training provision - Rewards to motivate employers to invest in training.

6.3 Long-term Strategic Transformation (3- 5 years)

In-depth creation of the skill ecosystem (Bano et al., 2022) - Competent development of overall labour market information systems - Competency framework development of key occupation – Career pathway and credential recognition system - Job platform and career services - Integrate formal and informal skill development.

Sustainable funding mechanisms (Bano et al., 2022) - Proper government budgetary allocations to TVET - Diversified sources of funds (employer contribution, social enterprises, development partners, and so on) - Cost-recovery measures (that allow sustainability) - Targeted scholarships (so that low-income earners can access) - Long-term funding commitments (that reduce uncertainty, etc.)

Regional equity and expansion (Bano et al., 2022) - Intensifying TVET infrastructures in underserved areas (Balochistan, KP, Gilgit-Baltistan) - Mobile training units to populations that are dispersed - Community-based and decentralized training solutions - Gender-specific programs to eliminate barriers to access among girls - Services targeting marginalized populations.

Institutional localization and sustainability (Bano et al., 2022) - Expertise transfer among Chinese and Pakistani institutions - Build Pakistani institutional capacity to develop curriculum and deliver training

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

- Less reliance on foreign experts and their knowledge - Systemic establishment of sustainable financing patterns - The integration of the system into the broader TVET in Pakistan.

Monitoring, evaluation, and continual improvement (Bano et al., 2022) - System tracking of primary outcomes of a program - Frequent assessment of the efficiency and impact of the program - Tracking of employment outcomes of graduates - Quality assurance measures and continuous improvement systems - Utilization of evidence to refinements and improvement of a system.

The University has equity and inclusion priorities in which it focuses itself.

Gender equity (Bano et al., 2022) - Have specific goals related to girls attending vocational training - Have girls-specific training programs that will tackle the barriers and concerns - Recruit and train female instructors who will act as role models - Provide girls accessibility in terms of scholarships and flexible schedules.

Regional equity (Bano et al., 2022) - Find out the most underserved areas and focus on training growth - Mobile training units and community-based training that helps reduce geographic barriers - Regional skills approach, considering local work opportunities - Decentralized decisions and regional response - Targeted investment in periphery areas.

Socioeconomic equity (Bano et al., 2022) - Free or massively subsidized training that includes the low-income groups - Scholarships and financial aid to allow people to participate - Flexible schedules to include working youth - Prerequisite education assistance to allow those with no secondary education to attend - Elimination of documentation needs that lock out marginalized groups such as the low-income ones.

Minority and marginalized group equity (Bano et al., 2022) -Anti-discrimination measures and their implementation -Direct outreach to marginalized groups -Culturally sensitive and inclusive training spaces -Access accommodation of persons with disabilities)-Acknowledgment of different backgrounds and identities.

7. Conclusions and Strategic Imperatives

7.1 Key Findings Summary

According to this systematic review of the industrial growth motivated by CPEC and skill-based education in Pakistan, some important results are given:

CPEC offers a historic opportunity but exhibits malign skills gap (Bano et al., 2022): USD 62 billion investment in CPEC promises to open up new avenues of economic growth that lead to millions of jobs in the construction, manufacturing, logistics, energy, and services industries. But the present Technical and Vocational Education and Training (TVET) system in Pakistan is still fundamentally out of line, as far as CPEC requirements are concerned because the present system has insufficient capacity, quality and responsiveness to handle the estimated demands in workforce. The disjuncture between the supply of skills and the demand of CPEC is one of the most important restrictions of economic returns and employment benefits (Bano et al., 2022).

There is a large skills misalignment between industry needs and training focus (Bano et al., 2022; Mutohhari et al., 2021): The existing vocational programs prioritize theoretical knowledge instead of applied skills, are poorly integrated with 21st-century skills (communication, teamwork, problem-solving, digital literacy), and do not focus on employer input and industry practices. The studies of the implementation of TVET reveal that there is a major challenge in the integration of contemporary competencies, and teachers mention communication skills, critical thinking, and digital integration as the most difficult ones (Mutohhari et al., 2021). Such curriculum-industry mismatch implies that the graduates usually do not have the competencies required by employers led by CPEC.

Limited institutional capacity (Bano et al., 2022): TVET institutions in Pakistan have an old-fashioned working equipment, inefficient funding, lack of qualified trainers, and decentralized governance. This indicates the failure of the TVET system in producing young workers since a high percentage of young employees, 60% of them, are highly unemployed and less skilled due to the lack of training in informal and non-formal sectors (Bano et al., 2022). Lack of infrastructure, connection to the

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

industry, teacher training, and funding are limiting the institutional capacity to provide quality at the necessary scale (Bano et al., 2022).

Inclusive development is restricted by the regional differences and inequality (Bano et al., 2022): The training infrastructure is clustered in developed provinces (Punjab, Sindh), and Balochistan, KP, and Gilgit-Baltistan are largely underdeveloped in spite of their high CPEC relevance. The differences in gender are still high with the involvement of girls being significantly lower compared to the boys. Poorest populations are restricted by socioeconomic issues. These equity disparities imply that the CPEC perks go to waste unevenly, with regions of periphery and marginalized groups being purposely marginalized (Bano et al., 2022).

Lack of Improvement: There is scanty evidence base and tracking (Bano et al., 2022): The effectiveness of TVET, employment rates, and CPEC skills match have a paucity of rigorous research. Not all programs have a systematic tracking of outcomes, and an evaluation of whether the training is related to an improvement in employment and income is not easily achieved. This is an evidence gap that restricts accountability and evidence-based improvement.

The integration of skills in the 21st century still lags behind (Muhali, 2019; Mutohhari et al., 2021): As the modern job market is increasingly demanding the skills of soft skills, digital literacy, and advanced thinking, Pakistani vocational programs do not enhance these skills. The evidence of the implementation of the 21st century learning reveals that in spite of the efforts, the competencies are not yet on the full scale with communication skills being at only 73% target, creativity and innovation at only 48% (Gunadi et al., 2022). This mismatch has resulted in graduates that are ill-equipped to work in the current modern and technology-intensive environments.

Education aspects of CPEC that are underdeveloped (Bano et al., 2022): Although CPEC is characterized by training programs (Pak-China Technical and Vocational Institute, cooperative agreement), the investments in education and training on the whole constitute insignificant part of total budget spent on CPEC (estimated less than 5 percent). Components of CPEC education are not only in a limited number of institutions but also lead to gaps in coverage. The heavy reliance on Chinese investments and experience poses the issue of sustainability (Bano et al., 2022).

7.2 Strategic Imperatives for Pakistan

Strategic Imperative 1: Develop Comprehensive National Skills Strategy Aligned with CPEC

Pakistan needs national skills strategy that is coherent and comprehensive and offers a single direction on vocational education and training (Bano et al., 2022). This strategy must:

1. **Establish clear vision and goals:** Have national vision on skills development, set high aims but realistic training coverage, training quality and outcomes of training and employment in CPEC timelines.
2. **Industry-specific approaches:** Work on specific strategies of skill development departments where CPEC is a core, construction, port operations, manufacturing, energy, logistics, and determining the necessary competences and training strategies.
3. **Regional strategies:** Build regional skills plans that capture CPEC geography and local labor market employment, and include specific targets in areas that are underserved.
4. **Clear equity goals:** Have specific goals of the participation of girls, equity by region, and access by marginalized population.
5. **Explicit roadmap of implementation:** Establish particular interventions, timeframes, assignment of responsibilities, and monitoring systems.

Evidence basis (Bano et al., 2022): Studies have demonstrated that the existence of coherent strategic direction significantly enhances the coordination of the system, resource allocation, and results of the developing country works. The situation where there is fragmented effort by various ministries in Pakistan cannot work as they do not have any single strategy.

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

Implementation: The government ought to now make itself tasked with developing national skills strategy by commissioning an inter-ministerial task force comprising of industry, education and development partners. Strategy is to be completed in 12 months and implementation started.

Strategic Imperative 2: Overhaul TVET Quality with Curricula Modernization and Pedagogic Innovation.

The existing Pakistani vocational education curricula do not equip labor with staff to work in CPEC industries, as well as in the modern world economy (Bano et al., 2022; Mutohhari et al., 2021). Desperate change of curriculum demanded:

1. **Integration of competencies in the 21 st century (Muhali, 2019):** Incorporate soft skills (communication, teamwork, problem-solving), digital literacy, critical thinking, and entrepreneurship systematically into the vocational programs, and do not as individual courses.
2. **Project-based/competency-based learning (Wan et al., 2016; Megayanti et al., 2020):** Change Action The shift between knowledge-centered and competency-based evaluation, make the learning process centered around real-world projects and problems in the workplace, allow students to illustrate real job skills.
3. **Employer-led curriculum development (Bano et al., 2022):** Implement institutional procedures by which employers which serve as the main source of knowledge of skill requirement actively contribute to curriculum design, review, and change.
4. **Content and practices that are industry relevant:** Make sure that curriculum content is up-to-date and indicates industry practices and pedagogies that resemble the activities in the workplace rather than the classroom setting.
5. **Frequent curriculum changes:** Have in place procedures that allow quick revision of curriculum in order to remain abreast with the pace of the dynamic technology and rise in employer demands.

Evidence basis (Megayanti et al., 2020): The development of project-based learning shows that it has the beneficial effect on students in terms of critical thinking, problem-solving, communication, and collaboration that are required in the modern working environment. Competencies are more effective in demonstrating genuine job preparedness as compared to knowledge test (Shute and Rahimi, 2017). Employer involvement in curriculum makes it relevant and more likely that graduates have sought skills (Bano et al., 2022).

Implementation: Commercial Authority Curriculum Development Authority should be instituted by the government with the representation of employers. The revision of curriculum in priority sectors (construction, port operations, manufacturing, energy) should be carried out in 2024-2025. Training the teacher on new pedagogies (Snchez et al., 2020) is critical to the success of implementation.

Strategic Imperative 3: Massively Invest in TVET Infrastructure, Equipment, and Teacher Development

Existing institutional capacity in the TVET is grossly inadequate to economic forecast demand (Bano et al., 2022). Large investment will be needed:

1. **Infrastructure development:** Construct new training facilities in geographically new areas (Balochistan, KP, peripheral areas) and develop current ones in high-demand areas.
2. **Modernization of equipment:** Proffer modern equipment, tools, and technology that are a reflection of industry standards, and not obsolete equipment that leaves graduates ill equipped to work in the modern workplaces.
3. **Teacher development:** Introduce an extensive teacher training and professional development program that incorporates content knowledge and adult education pedagogy and industry connection that guarantees the up-to-date knowledge (Snchez et al., 2020)
4. **Instructor recruitment and retention:** Development of competitive pay that attracts good trainers, career development, and career progression that retain well-unfledged trainers.
5. **Learning resource development:** Design recent textbooks, manuals, videos, and electronic material in accordance with new practices.

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

Evidence basis (Snchez et al., 2020): In essence, the quality of instruction is a determinant of learning. Poor teacher training restricts the implementation of curriculum and learning of the students. The contemporary machinery and resources necessary to develop the competency required in the relevant fields of business on a practical basis (Bano et al., 2022).

Financing: It is a big investment that will need cost increment in the government budget, foreign partners, and the use of the private sector. Annual requirement estimated about 0.5 percent of the government budget, not very large compared to the expected benefits to the economy (Bano et al., 2022).

Implementation: The government is required to set up TVET Modernization Fund under 5-year implementation. Preferential investment in institutions working with the centers of CPEC employment. International relations that allow transfer of technology, as well as develop expertise, must be taken advantage of.

Strategic Imperative 4: Build Systematic employer-education alliances and Labor Market Connection.

Existing lack of engagement between training and employer organizations can be discussed as the crucial impediment to efficiency (Bano et al., 2022). Systematic partnerships necessary:

1. **Industry advisory committees:** Researcher advisory committees on the industry level: these groups are made up of industry-specific employers whose input is regularly relied upon to give feedback on skill needs, curriculum relevance, graduate competencies.
2. **Formation of apprenticeship:** Establish a system of formalized apprenticeship which is a combination of classroom training with employer training, and classroom training is subsidized by the government.
3. **Employer involvement in learning:** Develop systems that allow employers to give lectures, mentor students, equip students, visit their place of work.
4. **Job placement services:** Have career services that assist graduates to identify employers and aid them to find jobs.
5. **Frequent employer feedback:** Develop routine mechanisms gathering employer responses on graduate competencies, as communication of ongoing improvement.
6. **Labor market information systems:** Design systems that monitor employment trends, wage patterns, skills requirements to generate information to make training contingencies.

Evidence support (Hardie et al., 2020): Those countries in which employers have high levels of involvement in vocational education (Germany, Switzerland, Australia) have better employment rates and employer satisfaction. Models of apprenticeship that involve a structured employer input that is specifically successful in terms of employment outcomes (Hardie et al., 2020). Employer involvement increases training relevance and employing graduates by the employer (Bano et al., 2022).

Implementation: The government must put in place the National Industry-Skills Council that is comprised of key CPEC employers and institutions and government of TVET. Construction, manufacturing, energy, logistics, port operations specific employer groups were formed. Pilot programs were initiated and regulations on the apprenticeship developed.

Strategic Imperative 5: Providing Regional Equity and Access to Quality Training.

There should be fair distribution of CPEC benefits both regionally and among the population (Bano et al., 2022). Equity imperatives:

1. **Geographic growth:** Focus on expansion of training in areas with limited coverage Azarijan province, KP, Gilgit-Baltistan, rural areas- Mobile and community based training in these areas.
2. **Gender equity:** Have targeted percentages on girl participation (at least 40 percent targeted in most trades), introduce girl-specific programs on the obstacles, find female trainers to act as role models.
3. **Socioeconomic equity:** Free or greatly subsidized training to low-income households, elimination of prerequisite conditions that restrict access, flexible institution of time to go to school as a working teenager.

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

4. **Inclusion of minority and marginalized:** Non-discriminatory policies, specific outreach to marginalized groups, and making sure to make services accessible to persons with disabilities.
5. **Regional skills strategies:** Work out the strategies that indicate local labor market opportunities and current capabilities within the region.

Evidence basis (Sayer & Braun, 2020): Inclusion education has more extensive consequences of development, decreased inequality, and facilitated the full acquisition of human capital (Sayer and Braun, 2020). Marginalized populations have a significant chance to reach quality outcomes and access when equity interventions are adequately designed and allocated resources (Sayer and Braun, 2020).

Implementation: Government is to set up Equity Task Force coming up with regional and inclusion plan. Specific scholarships are created and provided to disadvantaged groups. Recruitment of female instructors and gender specific programming. The regional development plans that were consistent with CPEC geography with the equitable sharing of benefits.

Strategic imperative 6: Build Long-term Funding and institutional building capacity.

The reliance on external funding and the poor government distribution compromises sustainability (Bano et al., 2022). Funding that is sustainable is needed:

1. **Budget allocation by the government:** Considerably increase state investment in TVET and build sufficient baseline funding that will allow quality delivery.
2. **Diverse sources of finance:** Establish various channels of funds such as Employer funds, cost-recovering of advanced training, social-based enterprises, and funding of the development partners.
3. **Public- Private partnerships:** These are institutionalized partnerships with the involvement of the partners and the parties concerning the engagement of the private sector and investment with the advantage of the public and fairness.
4. **Localization and institutional building:** Systemically create Pakistani institutional capacity to develop curriculum and trainings and manage the system without relying on foreign expertise.
5. **Mechanisms of cost-effectiveness:** Establish setups of efficiency (modular training, technology based learning, mobile units) capable of delivering quality at a cheaper price.

Evidence basis (Bano et al., 2022): The sustainable skills systems need to be properly funded by the government that is complemented with the private investment. Excessive reliance on donor subsidies puts it at a disadvantage when it comes to fund alternations. Capacity development at an institutional level facilitates the possibility of having a sustainable system in the long term (Snchez et al., 2020).

Implementations: Government must provide minimum 1 percent education funds to TVET (estimated 0.3-0.4 percent now). Higher level training arrangements grew cost-sharing. Partnership arrangements that are found between the government and corporations. Training given to Pakistani employees so that they can acquire skills to gradually replace foreign knowledge.

Strategic Imperative 7: Institution of stringent monitoring, assessment, and fact based enhancement frameworks.

Accountability and improvements are somewhat hampered by critical evidence gaps (Bano et al., 2022). Full monitoring and evaluation systems needed:

1. **Employment outcome tracking**: Develop systems that monitor the employment and earnings of graduates, employment retention, to provide a measure of training effectiveness.
2. **Quality indicators and monitoring:** Set quality standards and frequent monitoring of training institutions, quality of instructions, and competency in the achievement of students.
3. **Program evaluation:** Conduct stringent program reviews on employment outcomes, cost effectiveness and factors that would facilitate success.
4. **Labor market study:** undertake frequent research on the labor demand skills, labor trends, wage trends on which training assessment is to be conducted.
5. **Systems of continuous improvement**: Base on data to determine programs not running effectively, effective strategies, and improvement opportunities.

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

6. **Accountability mechanisms:** Instill responsibility on the outcomes where there are penalties on poor performance and rewards to high performance.

Evidence basis (Shute and Rahimi, 2017): Evidence based systems can be used to find useful strategies and do not stop improving. Devoid of outcome data, the programs perpetuate ineffective practice. The mechanisms of accountability encourage quality, and the effectiveness (Bano et al., 2022).

Implementation: The government ought to have the National Skills Monitoring System that gathers post-employment data of graduates. Quality assurance structure established based on accreditation needs. Major initiatives have program evaluations every year. Periodic research of labor markets. Publication of annual report on the performance of the TVET system.

7.3 Specific Actions for CPEC Alignment

Immediate CPEC-Specific Initiatives	Expansion and operationalization of Pak-China Institute (Bano et al., 2022):	Fast track full operationalization of Pak-China Technical and Vocational Institute, Gwadar Increase capacity of existing small figures to thousands of yearly trainees Introduce satellite institutions in other CPEC industrial areas Design outcome measures to connect graduates with CPEC employers Start systematic outcome measurement.
	CPEC industry-specific training programs (Bano et al., 2022):	Organize industry-specific training on construction professions (electrical, welding, machinery operation) in connection with infrastructure projects Manufacturing training to be developed in industrial zones (machinery operation, quality control, machine maintenance) Train specialists in hydropower, thermal, and renewable energy projects Find Chinese experts to transfer to the country and develop training programs.
	Employer-skills alignment initiative (Bano et al., 2022):	Prioritize quick skills need assessment among major employers of CPEC (Chinese construction companies, port operators, energy firms) Find out specific competencies, qualification levels, employment plans Establish joint training committees with major employers DESIGN employer-sponsored training programs STEP Elementary training and apprenticeship placements with CPEC employers
CPEC Integration in the Middle Term.	Training centers associated with industrial areas (Bano et al., 2022):	Create training facilities in or around CPEC industrial areas Coordinate training to match zone-specific job demands Facilitate speedy job entry to zone workers Provide adequate infrastructure, equipment, and staffing to provide quality services.
	Phase-specific skills development based on stages of CPEC development (Bano et al., 2022):	Phase 1: Gwadar and southern Balochistan skills training growth Phase 2: Central Punjab industrial zones skills training growth Phase 3: Northern regions (Hattar, Karakoram Highway) skills training growth Secure the availability of training before employment Secure the creation of employment before training can be acquired.

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

	Transfer program Chinese-Pakistani skills transfer (Bano et al., 2022):	Systematize technology transfer between Chinese and Pakistani trainers Exchange programs, where Pakistani trainers can study in China Systematic knowledge transfer that leads to sustainability.

7.4 Hypothesized Results and Impact

The potential benefits of a strategic introduction of CPEC-oriented skills development are high:

Hypothesized Results and Impact	**Employment and income benefits (Bano et al., 2022):**	The number of employed youth with CPEC exceeds the number of unemployed and informal precarious work Large income growth among all trained new workers and their families Less youth unemployment and social ills Increased workplace competitiveness and productivity
	Regional development (Bano et al., 2022):	Training will allow residents to seize the opportunity of CPEC Decreased migration pressure in the periphery areas Regional capacity development as well as decreased reliance on foreign expertise Regional economic diversification and long-term advantages of competition.
	Economic competitiveness (Bano et al., 2022):	Employees who can effectively operate and maintain the CPEC infrastructure The decreased amount of reliance on foreign labor, greater employment rate among Pakistanis – Employment is more competitive since workers can acquire the necessary expertise Adds value to the economy in their higher-skilled jobs Makes the economy in the region and globally more competitive.
	Gender and social equity (Bano et al., 2022):	Significantly more girls participated in vocational training and skilled jobs Women and normal populations: Economic empowerment and agency Existing inequality: Broader benefits through inclusion Growth can be broader.
	Strengthening of the institution (Bano et al., 2022):	Modernized TVET system oriented towards the modern economy Invested capacity of the educational institution Improved industry-education associations Greater quality and relevance of vocational education.

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

7.5 Challenges and Prerequisites for Success

Critical Prerequisites	**Government dedication and political will (Bano et al., 2022):**	Continuous government investment and political commitment prior to elections Political endorsement of ambitious changes and resource distribution Good coordination among the various ministries and provincial governments.
	Institutional coordination (Bano et al., 2022):	Silo and fragmentation across organizations Providing coordination systems that work Common vision and strategy among stakeholders.
	Sustainable funding (Bano et al., 2022):	Government budget allocations to TVET are sufficient Development partners mobilization Investment and participation of the private sector.
	Capacity development (Snchez et al., 2020):	Size investment in the development of trainers Institutional capacity building that will allow the reform of the system Technical support and access to expertise.
Key Risk Factors	**Challenges in implementation (Bano et al., 2022):**	**A high level of funding volatility (Bano et al., 2022):** The government commitment diminishes, the initiative can stall everything Development partner funding will lead to vulnerability Ambitions may be curtailed by budget constraints. Institutional capacity issues can slack implementation Inertia to change due to vested interests Multiple actors having issues with coordination.
	The sustainability risks (Bano et al., 2022):	The CPEC Chinese funding stops: The program sustainability is not guaranteed The reliance on Chinese experience puts at a risk Delays in localization are a threat to the sustainability.
	Equity risks (Bano et al., 2022):	Benefits will not be evenly distributed unless equity is directly targeted There will be regional imbalances even when there are intentions to achieve them Gender benefits will not be achieved without particular action.

7.6 Comparative Lessons in International

The foreign experience provides a good lesson to Pakistan:

International Perspective	Work	Lessons
Germany/Switzerland two-system (Bano et al., 2022):	Powerful employer involvement and pledge Coherent career progressions and qualifications	**Lesson:** Formal employer engagement is

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

	Quality leading to good work-related achievement	dominant to achievement.
India's apprenticeship reforms (Bano et al., 2022):	Trying to formalize the informal apprenticeship The regulatory framework that would specify minimum standards The government rebate of the classroom elements	**Lesson:** It is difficult to strike a balance between formalizing and not formalizing the apprenticeship system.
The SENAI model of Brazil (Bano et al., 2022):	Industry-funded training based on payroll contribution Strong industry control and participation Sustainability based on dedicated financing	**Lesson:** Specific financing mechanisms allow sustainability.
Explosive growth in skills in China (Bano et al., 2022):	Intensive government investment in TVET Partnerships with employers in curriculum design and delivery Frequent evaluation of the curriculum in line with industrialization growth in the sector within a short time.	**Lesson:** A government willingness to commit resources to institutional development can lead to rapid
Southeast Asian integration approaches (Bano et al., 2022):	Regional skills infrastructures that allow labor mobility Recognition of cross-border qualifications More access to more high-paying jobs	**Lesson:** Regional cooperation is capable of improving opportunities.

7.7 Conclusion and Call to Action

This paper has demonstrated that writing constitutes a crucial element of the learning process in both educational and professional realms. This paper has shown that writing is an essential part of learning process whether in educational or working world.

China-Pakistan Economic Corridor can be seen as a historic opportunity to Pakistan and employment of young people. Nonetheless, it is the wish to create sufficient skilled labor force in tandem with CPEC labour requirements that is the key to actualizing this potential (Bano et al., 2022). The existing TVET system in Pakistan is still grossly out of shape in regards to the requirements as it lacks adequate capacity, quality, and responsiveness.

Such a systematic review indicates that education-industry gap can be filled through strategic interaction. The above evidence-based suggestions include: a national skills strategy, curriculum modernization, massive employer partnerships, equity focus, and intense monitoring and all these have been detailed to point to a clear direction in terms of aligned skills ecosystem to facilitate CPEC success. Angular development needs daily government investment, political desire and enormous capital outlay to succeed. Needs to break institutional fragmentation and establish coordination systems. Mandates changing TVET system which is out-of-date and into responsive system training workforce to meet the modern economy. Stipulates the need to make the benefits to be evident at a regional and population level.

The strategic window of opportunity now (Bano et al., 2022): The timeline of CPEC implementation generates the urgency to develop skills. It takes 2-3 years to have training programs in place and generate graduates. Stagnant implementation implies that Pakistan would not be able to optimize CPEC as an employment opportunity, which would have consequences on young people, regionalization, and economic benefits.

Call to action

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

Government: Authoritatively commission national development of skills strategy; invest heavily in TVET; facilitate coordination mechanisms at the institutions

Education Institutions: Modernise curriculum; invest in teacher training; create employer linkages - Employers: Contribute actively to skills development; create training opportunities, and equipment; create employer coordination mechanisms

Development Partners: Strengthen the system; technical assistance; encourage policy complementation with government investment

Civil Society: Advocate equity and accountability; track the situation; focus on the capacity building

Pakistan has huge human capital of young population. The development of strategic skills in line with CPEC has transformative potential namely; millions of young people moving to productive work in the region facilitating regional growth, making the economy more competitive and creating a better and more equal and prosperous society. This should be exploited by taking decisive action in synergy and probing action at once.

Target References Themes

The systematic review has incorporated the evidence in the following important sources:

Critical CPEC-TVET Research (Bano et al., 2022): In-depth exploration of new challenges in TVET in the CPEC setting, the report of skills problems, institutional capacity issues, and system change requirements.

Development of 21st Century Skills (Gunadi et al., 2022; Muhali, 2019; Mutohhari et al., 2021): The studies on competencies development in the 21st century involving the identification of significant deficits of the existing curriculum and pedagogy, especially in terms of soft skills development and integration of digital literacy.

Pedagogical Innovation and Project-Based Learning (Wan et al., 2016; Megayanti et al., 2020): Information in the effectiveness of project-based learning and competency-based learning method to teach modern competencies.

Teacher Professional Development (Snchez et al., 2020): Studies with a critical focus on the importance of quality teacher training and professional development as the key factors of successful educational change.

Social Equity and Inclusion (Sayer and Braun, 2020): Equity interventions and inclusive education strategies research applicable to guaranteeing CPEC is beneficial to marginalized groups.

Employment and Skills Assessment (Hardie et al., 2020; Shute and Rahimi, 2017): The studies on employment outcome and cost-benefit evaluation of skills interventions.

Key Recommendations Summary Table

Strategic Imperative	Timeline	Key Actions	Expected Outcomes
National Skills Strategy	0-12 months	Commission strategy development; inter-ministerial coordination	Unified policy direction; sector and regional strategies
TVET Quality Transformation	1-3 years	Curriculum modernization; teacher training; pedagogical innovation	Enhanced relevance; 21st-century competency integration
Infrastructure Investment	Ongoing	Equipment modernization; center expansion; teacher development	Increased capacity; improved learning environments
Employer Partnerships	Immediate	Industry advisory committees;	Better alignment; employment outcomes; sustainability

Journal of Business Insight and Innovation
Volume 2 Issue 1
ISSN (Print): 3006-2284 ISSN (Online): 3006-0982
https://insightfuljournals.com/

Strategic Imperative	Timeline	Key Actions	Expected Outcomes
		apprenticeships; job placement	
Regional Equity	1-5 years	Geographic expansion; mobile training; targeted support	Inclusive development; reduced regional disparities
Sustainable Financing	Ongoing	Increased government investment; diversified funding; cost-recovery	Long-term sustainability; reduced donor dependency
M&E Systems	Ongoing	Employment tracking; quality monitoring; program evaluation	Evidence-based improvement; accountability

This systematic review indicates that the gap between the industrial growth induced by CPEC and the education that is skill-based can be fixed with the help of strategic and coordinated efforts in Pakistan. It is time to act and the timeline of implementation is vital towards gaining employment benefits and transformative economic development.

References

Bano, N., Yang, S., & Alam, E. (2022). Emerging challenges in technical vocational education and training of Pakistan in the context of CPEC. *Economies*, *10*(7), 153.

Gunadi, G., Haryono, H., & Purwanti, E. (2022). The analysis of 21st century learning implementation and competency achievement of junior high school students in 3T regions. *Innovative Journal of Curriculum and Educational Technology*, *11*(1), 10-18.

Hardie, B., Highfield, C., & Lee, K. (2020). Entrepreneurship education today for students' unknown futures. *Journal of Pedagogical Research*, *4*(3), 401-417.

Megayanti, T., Busono, T., & Maknun, J. (2020, April). Project-based learning efficacy in vocational education: Literature review. In *IOP Conference Series: Materials Science and Engineering* (Vol. 830, No. 4, p. 042075). IOP Publishing.

Muhali, M. (2019). Pembelajaran Inovatif Abad Ke-21. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan: E-Saintika*, *3*(2), 25-50. https://doi.org/10.36312/e-saintika.v3i2.126

Mutohhari, F., Sutiman, S., Nurtanto, M., Kholifah, N., & Samsudin, A. (2021). Difficulties in Implementing 21st Century Skills Competence in Vocational Education Learning. *International Journal of Evaluation and Research in Education*, *10*(4), 1229-1236.

Sayer, P., & Braun, D. (2020). The disparate impact of COVID-19 remote learning on English learners in the United States. *Tesol Journal*, *11*(3).

Shute, V. J., & Rahimi, S. (2017). Review of computer-based assessment for learning in elementary and secondary education. *Journal of Computer Assisted Learning*, *33*(1), 1-19.

Sánchez, S. P., Belmonte, J. L., Guerrero, A. J. M., & Hinojo-Lucena, F. J. (2020). Flipped learning y competencia digital: Una conexión docente necesaria para su desarrollo en la educación actual. *Revista electrónica interuniversitaria de formación del profesorado*, *23*(2).

Wan Husin, W. N. F., Mohamad Arsad, N., Othman, O., Halim, L., Rasul, M. S., Osman, K., & Iksan, Z. (2016, June). Fostering students' 21st century skills through Project Oriented Problem Based Learning (POPBL) in integrated STEM education program. In *Asia-Pacific Forum on Science Learning & Teaching* (Vol. 17, No. 1).