Background Paper for

Draft Policy

Technical Education Punjab

May 2014

(Only for discussion)

Contents

Chapter 1

Back Ground

1.1   Context for the policy

Enhancing Punjab's Technical Education capabilities is essential for meeting Punjab's aspirations of becoming a major competitive player in the global knowledge economy, and to improve the livelihood of its people. Failure to productively employ the increasing population can have damaging economic and social implications for the state. Furthermore, there are significant deficiencies in the existing Technical Education system that needs to be addressed.

To clearly articulate the Government of Punjab's objectives with respect to Technical Education in the state and outline the strategies that will be adopted to transform the state into a hub for Technical Education, new policy for Punjab is necessary.

Key issues of Technical Education ecosystem are summarized below:

1.2   Development context of Punjab

A summary of the development context in Punjab in terms of the strengths, weakness, opportunities and threats for the state has been presented below.

Strengths
1) Punjab ranks fairly highly on the HDI parameters.
2) Punjab has relatively low levels of the population living below the poverty line.
3) The rural-urban monthly per capita expenditure divide is comparatively low in Punjab.
4) The state exhibits good nutrition levels for women.

Weaknesses
1) The decadal growth of per capita GSDP has slowed down considerably in recent year.
2) Aside from an overall slowdown in growth, sectoral growth rates have also retarded, including in the tertiary sector.
3) Punjab suffers from low sex ratio which is worrying indicator regarding the status of women.
4) The levels of institutional deliveries are low in Punjab.
5) The state faces challenges in the education sector as well with low GER levels at class IX, Class XI and college levels.

Opportunities
1) Punjab has a clear advantage in the farm sector and produces a strong base of supply of inputs for food processing, dairy and other agro-based industries.
2) Punjab is a major grower of cotton and has a long established industry of cotton spinning and weaving, strengthening the supply chain for finished products and apparel could see it catering to a rapidly growing domestic and overseas market for these products.

3) Opportunities also lie in the areas of petrochemicals, automotive components, bicycles and components, light engineering, machine tools and hand tools, leather, sports goods, pharmaceuticals and IT & Bio-Technology.
4) Working age population is set to increase in Punjab which can contribute to the economy if appropriately skilled and educated.

Threats

1) Unless policy, budget and program initiatives are undertaken in Punjab to address key issues, it may be overtaken by neighboring states.
2) If Technical Education is not provided with adequate support in Punjab. It could lead to falling employment levels.
3) Industrial investments and growth will suffer due to lack of skills.
4) The developmental agenda of the state will become complex with rising disparities among the people.

Addressing the challenges in the Technical Education system can help to address the need to train an increasingly youthful population, particularly if the course offerings can be brought in alignment with requirements of industry. Improving the education system would also help to curb social challenges such as low sex ratio and levels of Institutional deliveries through higher awareness levels. An improved Technical Education System could be the catalyst that Punjab's economy requires to reinstate its position as one the best performing economics in the country.

1.3 Summary of Issues

The following figure provides a graphical representation of the dimensions and the various tiers of Technical Education:

Dimensions	Areas of assessment	Key issues and challenges from assessment
Access	Financial, Information and Physical Access and Access to disadvantaged groups	1) Limited access to scholarships and affordability of Technical Education. 2) Low enrolment of girls and other backward classes into Technical Education (degree and diploma). 3) Insufficient number of hostel facilities for girls. 4) Imbalance of distribution of seats across engineering and polytechnics.
Quality	Quality of Delivery and Quality of output	1) Less number of accredited institutions perhaps attributed to the existing process of accreditation that is time-consulting. 2) Insufficient training of teachers and shortage of qualified faculty that adversely affects the delivery of Technical Education. 3) Lack of effective delivery systems and inconsistency in outputs such as number of distinctions and placements reflective of the poor quality of technical education system.
Infrastructure	Seating capacity, physical and academic infrastructure	1) Under utilization of capacity of vacancy of seats in both engineering and Polytechnics seats. 2) Severe deficiencies in Polytechnics w.r.t. academic infrastructure equipment, library facilities and other basic amenities such as drinking water, toilets, etc.

		3) Inadequate financial support from Government for operating expenses, faculty development and research.
Faculty Development	Strength of Faculty, Faculty Development and Faculty Appraisal/ Recruitment	1) Dearth of qualified faculty members e.g. number of faculty, who possess doctoral level qualifications required for higher level teaching positions in these institutions, is significantly low 2) Limited number of faculty trained through the faculty development programs inhibiting the faculty's development and growth 3) Lack of a robust system for performance appraisal system for faculty that tracks their outputs and rewards them adequately 4) Absence of an eligibility test on the lines of NET/SET for recruitment of entry-level qualified technical faculty.
Industry Orientation	Industry Academia Interaction, Entrepreneurial and industry focus in curriculum, Placement	1) Inadequate industry participation at all levels in aspects like curriculum development, research and faculty exchange programs 2) Very limited orientation towards entrepreneurship and innovation in the curriculum for engineering and technical education, lack of entrepreneurial culture amongst students 3) Wide inconsistencies in placements of students across institutes
Management and Governance	Institutional Structures, Management and Governance Mechanism and Information System	1) Weak capacities within institutional structures, such as Board of Governors to carry out effective strategies and oversight of institutions 2) Absence of comprehensive and reliable information system which provides information for informed decision making and enhanced information access for students and faculty
Access	Financial, Information and Physical Access and Access to disadvantaged groups	1) Lack of industries near 'rural' institutes affecting the overall quality of training offered. This along with lack of hostels and ineffective transport facilities affect the access to students from these areas 2) Low enrolment of girl students across trades which has also been expressed by the industry 3) Confusion among students when it comes to choice of trades and courses under different schemes 4) Low effectiveness of SDI courses in attracting the school dropouts and workers
Quality	Quality of Delivery and Quality of Output	1) Out-dated courses compared to the current requirements of the industry both in terms of curriculum and the demand of the trade itself 2) Need for introduction of computer courses and soft skills to keep pace with the technological advancement and the needs of the private sector especially in the services sector 3) Perceived lack of books/ learning resources on technical subjects specific to the courses/ trades.
Infrastructure	Seating Capacity, Physical and Academic	1) Overall demand supply imbalance in capacity especially across regions and 'popular/ new trades'

	Infrastructure	2) Lack of basic infrastructure facilities and their maintenance like buildings, toilets, drinking water, canteen, hostels, sports facilities, recreational facilities, staff room etc. 3) Lack of teaching related infrastructure and their maintenance like updated machinery, IT/ computer infrastructure for students, AV aids, well maintained classrooms, etc.
Faculty Development	Strength of Faculty, Faculty Development and Faculty Appraisal/ Recruitment	1) Shortage of Faculty in Government Polytechnics as indicated by the vacant posts, coupled by the skill mismatch in the current faculty. 2) Overburdening of faculty with other administrative responsibilities related to the running of the college that have adversely affected the quality of teaching 3) Need for a systemic intervention (for both government and private institutes) in the current system of faculty development in terms of training programs or industrial orientation offered to the trainers.
Industry Orientation	Industry Academia Interaction, Entrepreneurial and industry focus in curriculum, Placement	1) Lack of effective industry participation at all levels in aspects like curriculum development, management, and shop-floor training 2) Apparent mismatch in the demands of the industry and the quality of outputs from the IT system reflected in low levels of placements (both quantity and quality of jobs) and low uptake of the ATS. 3) Weak forward linkage with employment and Labor Departments. 4) Lack of institutional support in the form of mentoring and relevant training related to entrepreneurship. 5) *Lack of focus on Entrepreneurial promotional strategies.*
Management and Governance	Institutional Structures, Management and Governance Mechanism and Information System	1) Low financial and academic autonomy at the institute level which needs to be relooked. 2) Need to strengthen the inspection system and Academic Audit to be effective and the use the information collected for assessing the performance of the colleges. 3) Need to increase government focus/ funding in areas of monitoring and governance

Chapter 2

Vision, Mission and Policy Objectives

2.1   Vision for Technical education and industrial training in Punjab

"To create an equitable and open technical and vocational education ecosystem in Punjab, focused on excellence of education and training, that is responsive both to the aspirations of the youth of Punjab and needs of local, national and global trade and industry.

2.2   Mission

* To improve and upgrade quality of technical education in the state with greater focus on development and improvement of infrastructure, human resource and requisite knowledge management with latest tools and methodologies.
* To promote research and development in technical education in the state and empowering the researchers for decision making to achieve their research targets.
* To improve and ensure easy access to quality technical education in the state

2.3   Policy Objectives and Statements

In line with the proposed vision, the objectives that the 'Technical Education Policy of Punjab' is to achieve along with the respective policy statements that capture the key initiatives and interventions that can be undertaken to achieve the same. The policy objectives and statements have been grouped along the six dimensions discussed above.

Dimension Access: Financial, Information and Physical Access and Access to disadvantaged socio economic groups	
Policy Objectives	1) The policy aims to create and promote a culture of lifelong learning. 2) The policy intends to address the issue of information access by offering mentoring services, career counseling, appointment of certified counselors, conducting career guidance seminars. 3) The policy intends to improve financial access to learners from disadvantaged socio-economic groups. 4) The policy wishes to address the issue of physical access for trainees/students by introducing information technology enabled training in addition to creation of physical training facilities 5) The policy intends to ensure the right for everyone in Punjab to be trained in the competencies of their choice.
Policy Statements	1) The state shall work towards realizing the principle of multi-entry and multi- exit in the technical education to establishment culture of lifelong learning in Punjab. Enhancing flexibility in the academic process will ensure better learning opportunities, easy inter-institution transferability of students, improve educational quality and excellence and the ability to match students' needs and aspirations. 2) The state shall introduce steps to improve access to information by offering mentoring services, career counseling, appointment of certified counselors, career guidance seminars, etc.

	In addition, the state shall also take up steps for providing mentoring services at the institutes by recruiting competent student counselor as part of the permanent staff.
	3) The state shall launch multimedia and web technology based approaches involving creation of content/digital resources to enhance the learning experience both in terms of reach and quality. Clear framework and guidelines for introduction of ICT enabled training shall be created for this purpose.
	The state shall enable funding of ICT enabled training to cover fixed costs like hardware and software and recurring costs like connectivity, maintenance, utilities and supplies. The state shall also encourage providers of low-cost, accessible technologies through incentives.
	4) The state shall set up a Punjab Higher Education Finance and Loan Cell (PHEFLC) for provision of scholarships and education loans for deserving candidates.
	In addition, the state shall also implement a comprehensive talent management system including identification, allocation and disbursement of scholarships and support for low-interest loans to learners.
	The state shall launch new schemes such as 'earn while you learn' to encourage students to take up technical education.
	5) The state shall also create a brand for its Technical Universities to enable access to more funds. The state also set up institutional structures such as a Public Relations (PR) Cell and an International Relations Office to promote the University's brand.
	6) The state shall also constitute a Joint Working Group between DoTE and school and higher education departments, with representation from PTU and PSBTE to take forward the initiatives related to mobility between school and technical education and training.
	7) The state shall progress towards ensuring the right for everyone in Punjab to be trained in the competencies of their choice
Dimension Quality: Quality of Delivery and Quality of Output	
Policy Objectives	1) The policy proposes to improve quality of delivery in terms of introducing Quality Assurance frameworks and creating other institutional structures to enhance quality of technical education. The policy proposes to enhance flexibility of academic process for technical education courses and improve quality of training in terms of industry relevant curriculum and practical oriented training as well as assessment.
Policy Statements	1) The state shall take steps to improve quality of delivery such as launching a Quality Assurance Framework and Institutional Audits
	2) The state shall form a Punjab Technical Education Quality Assessment Authority (PTEQAA) to focus on various aspects of quality in technical education
	3) The state shall also form Joint Working Group to strengthen Science Education for improving quality of inputs into Technical Education.
	4) The state shall introduce flexibility of academic process through credit-based system for technical education courses to facilitate cross-learning
	5) The state shall also adopt strategies to prepare an adequate skill base in

	emerging green skills, in sectors that possess high greening potential. 6) The state shall conduct 'Student/Trainee Engagement Surveys (SES)' capturing the experience of students and faculty members of the delivery institutions to gauge the student participation in programs and activities and Student/Trainee Destination Surveys to understand the placement of graduates and nature of employment. The state shall also conduct 'Employer/Trainer Satisfaction Surveys' to ascertain employers' perception of technical education and its relevance to industry needs. 7) The state shall institute a system of performance incentives to encourage faculty and researcher to bring out research outcomes 8) The state shall also implement examination reforms as suggested by the Committee on Examination Reforms for bringing in transparency.
Dimension Infrastructure: Seating Capacity, Physical and Teaching Infrastructure.	
Policy Objectives	1) The policy aims to address the gaps between demand and supply in technical education in Punjab across various sectors. 2) The policy shall aim to ensure creation, revamping and maintenance of appropriate physical and teaching infrastructure (equipment, laboratories and teaching aids) for technical education in Punjab 3) The policy shall aim to facilitate adequate private and Government funding support for technical education in Punjab
Policy Statements	1) The state shall in close coordination with industry conduct periodic technical/skilled manpower assessment studies for introduction of new institutes as well as new courses. In addition, the state shall constitute a technical manpower skill inventory based on existing capacities and admission trends for various courses. 2) The state shall also consider revisions in the admissions policy to improve the access to courses while improving the viability of institutions. 3) The state shall publish 'College Population Index' prioritize and plan for capacity additions in underserved regions. 4) The state shall assess the current and short-term physical infrastructure needs of the institutes. The state shall compute and publish a composite index named 'Infrastructure Index' to benchmark infrastructure across institutes. The state shall also define and implement a norm for physical access to institutes. 5) The state shall prepare infrastructure plans to ensure further strengthening of existing infrastructure. 6) The state shall analyze and publish spending on technical education which will provide details on the various component-wise spending (which provides details of the percentage spend along components such as Infrastructure, Repairs and Maintenance, Faculty Development, Research, Quality improvement, Accreditation). 7) The state shall position Government institutes as benchmarks/mentors for other institutes in the region for excellence in education, research, training and capacity building 8) The state shall constitute a Technical Education 'Policy Planning, Implementation and Monitoring Cell (PPIMC)' to carry out extensive

	studies relating to demand forecast/ capacity assessment and for analyzing and publishing data on manpower needs and occupational forecasts.
Dimension	Faculty Development: Faculty Strength and Faculty Appraisal/ Recruitment
Policy Objectives	1) The policy shall aim to address the shortage of faculty/instructors through innovative strategies and initiatives in the Technical Education. 2) The policy shall aim to improve the quality of faculty/instructor development training to encourage and reward faculty/instructors by setting up institutional structures for the faculty/instructor development. 3) The policy shall also aim to set aside adequate funding for faculty/instructor development activities.
Policy Statements	1) The state shall conduct an assessment of the region-wise and branch-wise vacancy among faculty including the gender ratio and qualifications of the current faculty at various levels in institutes. Based on the assessment the department will carry out faculty/instructor recruitment through rapid recruitment drives and take up strategic initiatives to address faculty/trainer shortage. The state shall initiate the concept of a state-wide faculty bank. The state shall also implement a rational merit based transfer policy of faculty encouraging services in rural areas. 2) The state shall conduct a State Technical Education Eligibility Test on the lines of NET/SET for recruitment of entry-level qualified technical teaching faculty. In addition, the state shall roll-out Future Faculty Program (FFP) to identify potential faculty members for PhD students amongst PTU/other Universities students and introduce degree such as an integrated Bachelors/Masters Program for interested students to take up teaching positions/ career. Further, the state shall launch six-month certificate course on technical teacher training for students during the final year to encourage teaching careers for students. 3) The state shall conduct annual trainings for development of faculty members – new recruits as well as established faculty. The state shall also take steps to encourage faculty to upgrade their qualification through technology-enabled distance learning. 4) The state shall design and implement an extensive Faculty/Instructor Development Program (FDP/IDP) in collaboration with the respective industry's sector skill council. 5) The state shall explore partnerships with employers (public sector and private enterprises) for providing industry representatives to train the faculty. 6) The state shall create a separate cadre of administrators to assist in administrative functions like placement, infrastructure management, and Industry interaction, headed by a senior faculty member to assist the Principal in day-to-day work of administrative nature. 7) A comprehensive performance appraisal system for faculty, instructors

	and administrators with incentives for better performance shall be implemented. 8) In order to implement the aforementioned steps, the state shall create a Working Group on Faculty within TE 'Policy Planning, Implementation and Monitoring Cell (PPIMC)'. 9) The state shall constitute a separate Faculty Recruitment Board within PTU and PSTEB for recruitment related activities. 10) The state shall also set up a 'Faculty Development Cell' (FDC) within State Institute of Technical Teachers Training and Research(SITTTR) to design and develop Faculty Development Programs
Dimension	Industry Orientation: Industry Academia Interaction, Entrepreneurial and Industry focus in curriculum, Placement
Policy Objectives	1) The policy shall aim to improve linkage with industry through meaningful engagement with industry at all stages of industrial training 2) The policy shall aim to expand the self-employment opportunities for graduates passing out of the technical education system through promoting the culture of entrepreneurship. 3) The policy aims to promote the culture of research in the state
Policy Statements	1) The state shall set up a State Entrepreneurship and Placement Cell (SEPC) to design and implement the initiatives related to entrepreneurship and placements for institutes that do not possess adequate capacity. 2) In order to promote entrepreneurship the state shall initiate a program and strengthen existing Technology Entrepreneurs Parks (TEP) in each district where shared facilities and infrastructure will be created for the use of entrepreneurs, researchers and industries in Punjab. 3) The state shall conduct Entrepreneurship Awareness and Development Programs to create awareness about entrepreneurship, support innovation and commercialization of the business idea 4) The state shall explore co-branding of courses to engage private companies in various sectors for Diploma and Industrial Training. 5) The state shall strive to to improving linkage with industry across various platforms – the state shall set up events such as 'Higher Education Workplace Skill Olympiads' and Business Process Council to enhance the number of industry- institute interactions. 6) The state shall take up proactive steps to promote research activities in the state such as formation of a research forum that fosters dialogue between various stakeholders. Further, the state shall set up Research Laboratory and Knowledge Resource Centre either at the upcoming Multi-Disciplinary Academies or at the State Institute of Technical Teachers Training and Research Centre with its grants. 7) The state shall implement schemes to provide financial support along with access to equipment and facilities at institutes. The state shall organize research funds for colleges to incentivize research among faculty and students
Dimension	Management and Governance: Institutional Structures, Management and Governance Mechanism and Information System

Policy Objectives	1) The policy shall institute a strong monitoring and evaluation system to enhance the effectiveness of program delivery and impact evaluation of initiatives and schemes.
	2) The monitoring and decision making shall be supported by a comprehensive management information system.
	3) The state shall provide the technical institutes with greater financial and administrative autonomy accompanied by strong governance and accountability mechanisms to improve their responsiveness to the needs of the learners and industry.
Policy Statements	1) The state shall develop a blueprint for private sector involvement in training articulating how private partners can become involved in developing and managing such projects through innovative financing mechanisms including PPP for different aspects of training. The state shall also set up PPP Cell in the Department to facilitate this process.
	2) The state shall design and develop a Technical Education Management Information System (TE MIS) in line with the M & E framework for effective evaluation and informed policy planning.
	3) The state shall work towards a phased handover of government training institutes to autonomous managements to improve the efficiency of the management of these institutes while improving the levels of accountability of these institutes. This will pave way for reforms in funding linked to the performance of the institute.
	4) The state shall also establish 'Punjab Technical Education Accreditation Agency' for defining the standards of training in different domains and accredit institutions.
	5) The state shall also implement reforms for funding of institutes on the basis of performance of institutes. The state shall also revise the personnel policy to ensure accountability and outcomes.
	6) The state shall form 'Technical Education Gateway of Punjab' to connect all technical institutes in the state through technology platform.
	7) The state shall explore and enable various internal revenue generation activities from the facilities created at the institutes.

2.4   Key Indicators and Projections

In order to monitor the progress of the various initiatives undertaken as part of the project and measure the impact of the same, we have identified broad indicators with the projected targets over the next two plan periods. These are in addition to intervention specific indicators mentioned under the implementation strategy.

Sr No	Indicator	Current level (2011)	Target for FY 2015	Target for FY 2017	Target for FY 2022
1	% of students enrolled for UG tech programs out of XII pass-outs from science	31%	34%	38%	50%
2	% of enrolment into PG level courses as against pass-outs from UG students	NA	11%	21%	33%

3	% of students enrolled into undergraduate technical courses as against sanctioned intake	27%	40%	55%	80%
4	% of sanctioned intake for post-graduate/research technical courses as against undergraduates sanctioned intake	3%	7%	13%	20%
5	% of students enrolled into diploma technical courses as against sanctioned intake	61%	65%	70%	80%
6	Teacher: Student ratio for technical graduate courses	NA	1:25	1:20	1:15
7	Teacher: Student ratio for diploma courses	1:92	1:60	1:30	1:15
8	% of students graduating in the first attempt as against students enrolled (for PTU technical courses)	NA	70%	75%	80%
9	% of students graduating as against students enrolled (for Diploma courses)	69%	74%	80%	95%
10	Number of patents filed/ registered by TE institutions in Punjab per annum	NA	TBD	TBD	TBD
11	Number of incubated enterprises by TE institutions in Punjab per annum	NA	TBD	TBD	TBD
12	% of state budget allocated for technical education as a percentage of Education Budget (plan component)	NA	10%	12%	15%
13	Number of UG programs accredited by NBA	1%	12%	24%	33%
14	Number of PG programs accredited by NBA	1%	12%	24%	33%
15	Labour productivity measured as Output per Worker: Tertiary (Rs per annum)	153000	168300	185130	222156
16	Labour productivity measured as Output per Worker: Secondary (Rs. per annum)	106000	116600	128260	153912

Assumptions (provided against the serial number of the indicator):

1. Based only on the engineering data as received from PTU
2. One-third of the total students passing out of UG should pursue further education. Amongst the 33%, one-third to be groomed for teaching, one-third for research and the other one-third for jobs
3. Based on PTU admissions data
4. Based on PTU data: Sanctioned intake (PG): 1288, Sanctioned intake (UG):39990
8. Data for 2011 is uncertain and for the number of students per teacher, hence numbers have been calculated based on the final target of achieving AICTE norms of 1 teacher for 15 students
9. Data not sure for the number of students per teacher, hence numbers have been calculated based on the final target of achieving AICTE norms of1 teacher for 15 students
14, 15. Targets to be fixed later based on an assessment and in consultation with experts and stakeholders.
16. Targets based on 10th and 11th plan allocation and 12th plan approach trends

Chapter 3

Detailed Interventions and Implementation Strategy: Access

Based on the issues under each of the dimension relevant to technical education, the policy objectives and statements, outlined, have been formulated. This will detail the initiatives and interventions and provide details of institutional structures to carry out the interventions, broad timelines and key monitoring indications that may be tracked. Regarding timelines it has been assumed a period of 0-3 years as short term, 3-5 years as medium term and 5-10 years as long term. All the key activities have been classified accordingly. The indicative budget being provided here is for select activities under this Intervention, especially those that are important from the short and medium term perspective.

3.1   Key Actions:

1) Form a Joint Working Group between DoTE and School and Higher education departments, with representation PTU, PSBTE to take forward the initiatives related to mobility between school and technical education
2) Earmark low skill level professions and offer support services such as placement.
3) Introduce +2 equivalent certificate or pre-engineering course as an alternative to the conventional Std. XI and XII
4) Introduce steps to improve access to information by offering mentoring services, career counseling, appointment of certified counselors, career guidance seminars, etc.
5) Take up steps for providing mentoring services at the institutes, Polytechnics and colleges during the delivery of technical education such as recruitment of a competent student counselor as part of the permanent staff
6) Use ICT technologies to enhance the access through Web-based learning and multimedia
7) Develop clear framework and guidelines for introduction of ICT enabled vocational training
8) Create digital content to address requirement of learning resources
9) Create District level skill development and career Counseling services
10) Enable funding of ICT enabled training to cover fixed and recurring costs
11) Set up Punjab Higher Education Finance and Loan Cell (PHEFLC)
12) Implement talent management system for disbursement of scholarships and low-interest loans to learners
13) Create a brand for the universities to enable access to more funds
14) Set up institutional structures such as a Public Relations (PR) Cell and an International Relations Office to promote the University's brand
15) Progress towards ensuring the right for everyone in Punjab to be trained in the competencies of their choice

The target for school education is to ensure that every child completes secondary education. This, for a poor family, would mean an investment of 10 years in education, before the child will be eligible for financially supporting the family. The school education system should give good returns for this investment, by developing in the child the requisite

skills for a reasonable employment after Class X. The national framework on vocational education will train school children in skill development, which will increase the enrolment in polytechnic colleges in the state. In the proposed program, expected to start shortly, the student will be able to complete four levels till Class 12, and the remaining six levels till post-graduation. This can address the need to integrate education with skill development.

To accommodate the expected increase in the number of learners opting for technical education and to provide increased number of options for existing students the conventional approach towards training delivery must be aided and enabled by the technological interventions through ICT. This will also allow the knowledge resources to be available to every learner as per his / her convenience and just in time. The aim is to use e-learning as an effort multiplier for providing access, quality and equality in the sphere of providing education to every learner in the country. National Policy for ICT in Education is under formulation which highlights the need to integrate ICT as a subject in the curriculum as well as to strengthen the overall teaching learning process. However, technology should not drive education; rather, educational goals and needs, and careful economics, must drive technology use.

3.2   Detailed Interventions

3.2.1   Mobility from school education to technical education system

Following interventions will support such lateral movement from school education to the technical education system.

1) The state shall start offering orientation to various skills in high-schools to ensure that the students are better informed about the choices available to them after school. In addition, short term refresher courses should be designed and provided to allow students easy transition from school.
2) The competency framework should map the competency of a student gained through vocational courses during schooling so that he/she can apply for advanced courses directly. At the end of the course, the school should organize for the certifying agency to evaluate students for basic skill competency. All students completing the course will received a Basic competency skill certification.
3) Once vocational education is offered in schools, low skill level professions should be earmarked for students who are not able to continue education/training after school. Such students should be supported in placement for such jobs. The decoupling of evaluation and training would allow these students to certify themselves, in later time frame, after they gain substantial work experience.
4) The state shall make equivalence of 12th standard qualification for diploma holders to allow them to be eligible for various programs requiring a 12th standard certificate and also lateral entry into higher level in respective degree program. The experience of Longowal institute can be referred for such an option. Alternatively, pre engineering courses (in place of Std. XI and XII) at engineering colleges to feed into graduate engineering courses. Providing a +2 equivalent certificate for those who wish to pursue other than engineering after completion of such pre-engineering course.

3.2.2 Steps to improve information access

Mentoring during the education process can play a critical role in helping the student pursue the profession he/ she have the aptitude and interest for. In the transition to secondary education after Class 8 and after completion of secondary education (Class X), students are required to choose streams of education (science, commerce and arts) or for technical courses. The state may even consider starting up district-level mentoring and career counseling services which can assist the students with career options at different levels, thus ensuring success with multi-entry and multi exit system. Similarly, the state should take measures to ensure that every student makes an informed choice of his/ her diploma/ graduate course. These Counseling centers should also assess the attitudinal and behavioral aspects of the student and provide training on the same.

Similarly the state should take measures to ensure that every student makes an informed choice of his/ her diploma/ graduate course.

1) Institutes should ensure that every student has a mentoring session with a senior faculty before completion of any course. Such a session, to take place well before the examinations, should identify areas in which the student has an aptitude and interest.
2) To accomplish the above mentoring requirements in government institutions, the department should include a specific component in faculty training to enable them to be effective mentors.
3) The department should appoint certified counselors in every district. These can be identified from private practitioners and NGOs. The counselors should provide career guidance to students of institutes in the district. It should be mandatory for students to have at least one interaction session with the counselors.
4) Introduce a 24 hour telephone helpline for students after completion of Class 10 and 12 examinations and final year diploma and technical degree.
5) A career guidance seminar should be organized in every district of the state before the Polytechnics/University admission process. The seminar would involve talks by successful professionals from different fields.
6) During the delivery of technical education polytechnics and colleges should share responsibility for carrying out mentoring:
   a) They should commission and prepare career guidance literature for various career streams.
   b) They should recruit a competent student counselor as part of the permanent staff. The counselor should be accessible to all students of the university.
   c) Every institute should appoint a senior professor to be a Mentor (Faculty). The Mentor should make available specific hours in a week for mentoring students.
   d) The faculty should coordinate a formal mentorship program where senior students volunteer to help the new entrants.

3.2.3 Framework on ICT enabled technical education

Although the potential benefits of widespread application of ICTs are numerous, the key challenge lies in identifying the ways in which technology can be introduced and embedded in society to the best effect. A number of potential barriers to the effectiveness

of ICTs related to infrastructure remain including availability of power, provision and maintenance of ICT infrastructure; issues of connectivity, as well as accessibility to the training facilities. Hence, initially, a simple delivery system that minimizes the possibility of technical failures can be taken up and more sophistication can be built upon the success of these initial forays.

The state shall introduce of multimedia and web technology to enhance learning both in terms of reach and quality. This can include multiple approaches like

1) Computer based models
   a) Computer-Assisted Instruction (CAI) that uses the computer as a self-contained teaching machine to present individual lessons;
   b) Computer-Managed Instruction (CMI) that uses the computer to organize instruction and track student records and progress and/or
   c) Computer-Mediated Education (CME) consisting of applications that facilitate the delivery of instruction.
2) Multimedia based approach consisting of voice and video based instructional tools (in the form of CDs and DVDs) enhanced using interactive technologies like audio conferencing. Such learning technologies can be supported by books, workbooks and case studies. It should been ensured that the e-Learning material are expanded and updated continuously.

The current distance education platform at PTU can be extended to deliver the education and training and can be later decoupled to form an Open University for technical education.

A clear framework and guidelines for introduction of ICT enabled vocational training covering the following aspects needs to be created.

1) A clear strategy and approach to ensure the widespread application of ICTs in Punjab including clear targets, timelines, financials allocations and regional plans. Forums and platforms to identify and share insights on successful applications of ICT should be facilitated by the Government. This will help to identify best practices, particularly relating to the approaches adopted relating to developing content that was successful in accessing a large number of beneficiaries.
2) Strengthening capabilities of among the beneficiaries to appropriately utilize the technology for their benefit. Ensuring physical access to technology alone is not sufficient. A basic requirement for the use of some technologies such as the internet would be literacy. The Government should ensure that appropriate strategies to address the literacy lags in the state are addressed. ICT could also be taught as a subject in secondary education to provide the necessary skills needed to utilize these technologies. This may imply activities ranging from setting up computer labs to developing ICT curricula.
3) Identification of courses and creation of suitable curriculum. Initially courses like communication, safety and quality practices, and other soft skills may be introduced along with modules on theory for technical courses. These courses should be linked to the skill/ vocational framework.

One of the key advantages of ICT based learning tools is that the pace of learning is student dictated. To address this situation, knowledge modules should be designed such that based on the personalized needs of the learner training would need to be delivered to him /her at the right time with the right content to take care of his / her aspirations.

4) Creation of content/digital resources to ensure improvement in quality of education. Training material should be created by involving sectorial skill councils, enterprises and industry associations. In this aspect, the experience and support of the private and non-profit sector should be sought. Standardization& Quality Assurance of e-Content should be ensured.

5) Creation of a structure that would support lifelong learning especially informal and workplace learning like mentorship programs for tutorial support in online interactive mode, allowing learners to participate in Employment Fairs at the end of programs.

   District level skill development and career counseling services can also be offered through the infrastructure created through this program. Existing employment exchanges can function as career counseling centers and providing information on employment and skill development to prospective trainees.

6) Financial Allocations for fixed costs (retrofitting of physical facilities, hardware and networking, software, upgrades and replacement) and variable/ recurring costs (connectivity, including Internet access and telephone time, maintenance and support, utilities and supplies). PPP (Public Private Partnerships) can be opted to either pilot or fast track the ICT-based training project. Existing open and distance education systems in addition to radio, TV and mobile phones can also be considered for the delivery of the training. Provision of the infrastructure has been discussed in detail below.

7) Given that the knowledge and skill set required by an individual will be expanded, the current trainers' needs to keep up with the demand. Hence, capacity building among trainers and administrators including digital/information literacy programs for teacher empowerment is required.

8) In parallel the student information database (as part of the TE MIS) would be developed and maintain the knowledge and capability profile of every individual learner / worker.

9) Infrastructure can refer directly to ICT infrastructure, such as the number of radios that are available, as well as to prerequisites for the use of ICT, such as electricity, etc. The department should particularly focus on ensuring provision of the latter which would be an enabler for promoting the use of ICTs.

The department should give encouragement to providers of low-cost, accessible technologies which are locally-owned as these would be more widely applicable to beneficiaries and hence likely to have a wider impact. Choosing simple, locally appropriate solutions that may not require high connectivity or high-level of human capacity is key. Incentives such as tax concessions for providers of ICTs which have social benefits should be provided by the Government to encourage them.

In order to make availability of the information and career guidance for students, apart from the placement cells in the institute, the state may consider repositioning the

existing employment exchanges to provide the counseling and information services regarding choices available to the students post school education and post certifications.

3.3 Set up Punjab Higher Education Finance and Loan Cell (PHEFLC) and Talent Management System

While there is a view that the government may discontinue financing higher education institutions, there is a concern that removing the grant-in-aid could adversely impact the economically weaker students. It is suggested that the provision of grants/ scholarships should move from a system of 'block' grants to institutions to 'individual' grants to the needy. Such a shift can save substantial resources of the government. However, before phasing out block grants, it should be ensured that 'no student is denied education due to lack of funds'. However, students should be made aware of the actual cost of a course. If they are economically weak they can apply for a fee waiver, or low interest loans.

The state can form a 'Punjab Higher Education Finance and Loan Cell (PHEFLC)' on the lines of National Minorities Development & Finance Corporation (NMDFC within MHRD, GoI) to provide scholarships and educational loans to deserving candidates to pursue professional educations especially for disadvantaged sections (including girls). This cell can be placed under the PTU in case of graduate and higher programs, under PSBTE for diploma programs. Under this arrangement, the banks (possibly a cooperative bank) and university provide loans to the students. While the bank assumes the administrative responsibility of disbursement and collection, the university/board funds part of the loan interest to reduce the burden to the students through the 'interest subsidy'. The government should ensure that banks, especially state-owned banks do not reject any education loan unless they have a substantial reason to do so. In case the loan is rejected, the student should have an option to approach the PHEFLC directly, who in turn directs banks to approve the proposal. State governments such as Karnataka and Maharashtra are providing interest subsidy on education loans. Alternatively the PHEFLC can function as an independent authority under Section 25 of the Companies Act, or a Trust under the Societies Act. Such a body will be responsible for:

1) Institute schemes such as fellowships and scholarships based on merit-cum-means for students from disadvantaged sections and economically weaker sections within certain limits
2) Launch specific scheme for 'female students' to encourage them to undertake technical courses
3) Deciding norms under which benefits shall be made available to students
4) Offering educational loans at subsided interest rates for female candidates and other deserving students via having tie-up with Banks
5) Cover bank loans to students who have been admitted into top-few institutions to ensure that no deserving student is denied technical education. The program for student loans can be designed in such as a way such that loans are written off where graduates serve for a specified period in certain professions such as engineers/technicians in defense forces or perhaps faculty in a remote engineering college. The writing-off of the loans can be taken up on a case-to-case basis depending on the profession taken up by the students.

6) Publish information and profile of students who have availed of such scholarships and fellowships to encourage other students to apply.

7) Maintain a database (linked to TE MIS discussed later) of information pertaining to beneficiaries based on the various categories such as Scheduled Castes, Scheduled Tribes, Minorities, Other Backward Classes, and Others; along with sub-classification in terms of gender, differently- abled / persons with disabilities as well as the disciplines/programs of study, year of enrolment and programs as also the specialization of study, institutions, locations, State-wise and Bank-wise.

8) Introduce an insurance scheme for students pursuing higher education, in order to offer financial assistance to them in the event of death of guardians where the nominal premium amount for the insurance policy can be paid either by the student or colleges from 'Students Welfare Fund' to the insurer of the scheme. Such a scheme will help to protect the educational prospects of the students pursuing higher education.

9) The program for student loans may be designed such that loans repayments are deferred where graduates serve for a specified period in certain professions such as doctors in govt. hospitals, engineers in defense forces and teachers. The interest component for the period of deferment can be borne by the PHEFLC.

10) In addition, a comprehensive talent management system including identification, allocation and disbursement of scholarships to learners electronically can be developed. This system (developed as part of the TE MIS) should track the allocation and disbursement of scholarships to various groups like girls/women, physically challenged, rural poor, urban poor etc. Learners could be funded in two parts- (i) Stipend (monthly) to be paid to trainee; (ii) Fee subsidization at the end of the program to be given to the institute after placement.

In addition, innovative financial support mechanisms like 'Earn While you Learn' can be explored as has been proposed in some universities like Azim Premji University to support working professionals opting for further education, etc. (refer box item below)

3.4   Create a brand for the university to enable access to more funds

Unlike Universities in the western countries, there is hardly any global awareness of technical Universities in India barring the IITs and IISc. Many of our Universities have been involved in pioneering work, but their contributions have not been showcased to the world. Universities should thus initiate a 'brand building' exercise to showcase its strengths (in research, quality higher education) and create an identity for themselves.

The creation of a brand and growing awareness of the university can entail multiple benefits. First, it will attract foreign students to seek admission into universities, particularly those that are interested in the work done by the university. Secondly, growing awareness in the industry would bring in more projects in specific areas of study. Thirdly, it will create a sense of pride and belonging in the alumni to be part of a globally recognized university. All the above three are significant options for raising resources. To maintain these options as sustainable source of funds, Universities should complement the brand-building with creation of structures and enablers to facilitate them.

In this context, the following initiatives can be considered

1) Universities should undertake a program for brand building. Indicative steps as part of a brand-building exercise are:
   a) Create a Public Relations (PR) Cell as the external interface of the university. The cell should keep the media informed of activities in the university.
   b) Showcase successes of the university as well as alumni of the university in various media.
   c) Encourage faculty/ students to publish articles in newspapers/ magazines.
   d) Development of a good website for the university is critical to attract international students.
2) Universities should constitute an International Relations Office.
3) This Office should coordinate admissions of foreign students.
4) The Office should also coordinate with the university administration to ensure that all foreign students arriving at the university have comfortable accommodation and adequate mentorship.
5) To create a structure for alumni participation, universities and PSBTE should establish an association of all alumni. All alumni can be eligible for membership on payment of a one-time fee. The association should have a governing body headed by a professionally qualified professional. Activities of the alumni association include:
   a) Sending regular newsletter update on the university to all members, maintaining the Alumni website, blog, etc.
   b) Organizing an Alumni reunion every year, each year commemorating one batch of alumni.
   c) Constitute local chapters of the alumni association in national and international hubs where there are a large number of alumni.
   d) Preparation of project proposals which can be readily funded by the alumni.
   e) Engaging with Alumni on various aspects like placement, internship, curriculum, etc.

3.5   Institutional Mechanisms

With respect to input quality, poor mathematics / science education at School level affects the quality of the students entering Technical Education hence affecting the output quality of Technical Education. To address this, a Joint Working Group between DoTE and school and higher education departments, with representation PTU and PSBTE should be constituted to take forward the initiatives related to mobility between school and technical education and training and to improve the mathematics / science education (at schools).

The state can form a 'State Higher Education Finance and Loan Corporation (SHEFLC)' in case of graduate and higher programs, under PSBTE for diploma programs.

The overall responsibility for undertaking the interventions related to ICT would rest with the DoTE who can be supported by the distance education experience of Punjab Technical University in the initial stages of the program. Initially a working group on access under the TE'Policy Planning, Implementation and Monitoring Cell (PPIMC)'can be entrusted with the design of the framework for integrating ICT enabled training and skill development with the mainstream training system. Over the medium term, a separate division/ unit can be created to implement and manage the ICT program under the PPIMC cell or as a separate entity.

The branding related initiatives should be taken up by individual universities for programs and institutes under its purview whereas the transition towards the right to skill falls under the aegis of the Department.

3.5.1 Key Activities and Timelines

Activity	Timeline
Steps for lateral movement from school education to skill development and training system	Short Term
Earmark low skill level professions and offer support services such as placement	Short Term
Introduction of a +2 equivalent certificate or pre-engineering course as an alternative to the conventional Std. XI and XII	Short Term
Introduction of steps to improve access to information by offering mentoring services, career counseling, appointment of certified counselors, career guidance seminar	Short Term
Develop clear framework and guidelines for introduction of ICT enabled vocational training	Short Term
Steps for providing mentoring services at the polytechnics and colleges during the delivery of technical education/training	Medium Term
Recruit a competent student counsel or as part of the permanent staff	Medium Term
Create a District level skill development and career counseling service	Medium Term
Setting up Punjab Higher Education Finance and Loan Corporation (PHEFLC)	Medium Term
Implementation of talent management system for disbursement of scholarships and low interest loans	Medium Term
Creation of a brand for the university to enable access to more funds	Medium Term
Set up institutional structures such as a Public Relations (PR) Cell and an International Relations Office to promote the University's brand	Medium Term
Enact 'Right to Skills' legislation	Long Term
Activity	**Indicative Budget (In Lakhs)**
Development of framework and guidelines for introduction of ICT enabled technical education	75
Creation of district level skill development and career counseling service (22 districts)	220
Setting up and operational zing Punjab Higher Education Finance and Loan Corporation (PHEFLC) under PTU/ PSBTE	1000
Rebranding and repositioning activities for Technical Education (University/Board)	100
Total	**1395**

3.5.2 Monitoring Indicators

Outputs	Outcomes
Region wise number of courses offered by ICT enabled delivery	Number of applications received for ICT enabled courses

Amount spent in creating ICT infrastructure	Number of women, backward classes, and minorities enrolled in ICT enabled programs
Number of scholarships disbursed by PHEFLC	
Number of beneficiaries of scholarships	Institute wise trainee and recruiter satisfaction levels as determined by the trainee engagement surveys (related to ICT enabled program delivery)

Chapter 4

Detailed Interventions and Implementation Strategy: Quality

4.1 Key Actions:

1) *Improve quality of delivery by introducing various measures such as Quality Assurance Framework and Institutional Audit.*
2) *Form a Punjab Technical Education Quality Assessment Authority (PTEQAA) to focus on various aspects of quality of technical education.*
3) *Conduct periodic 'Student/Trainee Engagement Surveys', 'Student/Trainee Destination Surveys' and 'Employer Satisfaction Surveys'.*
4) *Formation of Joint Working Group to strengthen Science Education for improving quality of inputs into Technical Education.*
5) *Introduce flexibility of academic process through credit-based system for technical education courses to facilitate cross-learning.*
6) *Develop competency framework for state-wide consistent recognition of training/skill outcomes.*
7) *Provision of multi-entry/multi-exit system for students of all tiers (Diploma/Degree)*
8) *Support up-skilling and improving employability of trainees and students*
9) *Enabling research and innovation to promote industry linkages.*
10) *Knowledge management through improving the IPR regime*
11) *Institute a system of performance incentives to encourage faculty and researcher to bring out research outcomes*
12) *Implement examination reforms as suggested by the Committee on Examination Reforms for bringing in transparency*

The quality of education received by the student is paramount to all other concerns. An independent assessment of learning achievements is the only way to comprehend the quality of education and may serve as a starting point for future educational policies.

The National Knowledge Commission recommends increase in the flexibility of VET within the mainstream education system through a series of initiatives including retaining aspects of general education (such as numeracy skills, etc.) in VET, modifying entry requirements to permit multiple entry and exit options in the vocational education stream, establishing links between the vocationally education stream and school education as well as higher education, schemes for lifelong skill up-gradation, etc. Some of the key recommendations are

1) Aspects of general education (such as numeracy skills, etc.) should be retained in VET as far as possible, to enable students to return to mainstream education at a later stage.
2) Courses in polytechnics should have distinct tracks for students of different educational attainments.
3) Links should be established between the technical education stream and higher education.
4) Courses devoted to certain skills training at the primary and secondary level should be introduced in all schools.

5) Schemes for lifelong skill up-gradation, through short training programs, should be introduced.

6) It is essential that students in universities are exposed to various fields of study. Such education will give them new perspectives and will influence the way they perceive issues. For instance, students of medicine should be exposed to courses in humanities; it is useful for students of engineering to take up a short course in project management. However, even with the availability of different courses of study, there would be little cross learning if not facilitated by the structure of programs offered by the universities.

4.2 Detailed Interventions

4.2.1 Quality Assurance Framework and Punjab Technical Education Quality Assessment Authority (QAA)

Since the National Board of Accreditation (NBA) which accredits individual program offerings of engineering institutions is itself plagued by issues such as shortage of staff, longer time to process information, inappropriate use of online data systems and slow decision-making, it is best for Punjab to create a quality assurance framework that all institutions can follow to ensure uniform quality of education.

Punjab's technical education Quality Assurance Framework could probably comprise of the following:

1) Annual program monitoring: The Program would be monitored on metrics decided by the University

2) Internal student surveys to ensure that students are satisfied and act upon the feedback given by students to improve student experience. This can also help improve the range of services offered to students and to maintain an overview of the general student experience.
   a) 'Student/Trainee Engagement Surveys (SES/TES)' (once in 2 years) capturing the experience of students/trainees, recruiters and faculty/trainers of the delivery of training/ implementation of various schemes should be carried out to gauge the quality of delivery of education/ training. This can serve as an input to rate/ accredit training institutions according to their performance.
   b) Apart from this, 'Students/Trainees Destination Surveys (SDS/TDS)' should also be carried out periodically (once in 3 years) to ascertain the preferences of students post graduating with regard to and serve to answer the question such as 'Where are our graduates now', Nature of employment, relationship between study and work, usefulness of curriculum and provide overall feedback mechanism to improve course content and delivery. In addition, this survey will also indicate the mix of students entering local industry and industry from outside Punjab/ India, higher education and those opting for entrepreneurship. A pre-requisite for such an exercise is an updated alumni directory (which can be maintained in the TE MIS). Continuous engagement with alumni can also help improve the placement of current students. SDS/ TDS can also serve as an input in planning augmentation of capacities in different courses.

The data from these survey results can be used by the government and institutions to identify aspects of the study experience inside and outside the classroom that can be improved through changes in policies and practices more consistent with good practices in education/ training. This information can also be utilized by prospective students, their parents, college counselors, academic advisers, institutional research officers, employers, and researchers in learning more about how students spend their time at different colleges and universities and what they gain from their experiences.

1) Institutional audit which can be at the core of the institutional quality assurance. The main objective of institutional audit will be to encourage higher education providers to cultivate and maintain a culture of continuous performance improvement and to enable institutions to develop reliable quality assurance performance indicators. The audit would also serve the purpose of providing information to stakeholders and the Department of Technical Education/Board/PTU/Universities/Colleges on the strengths and weaknesses of the institutions. The institutional audit can cover the following aspects:
   a) Institutional governance (Vision, mission, strategic planning)
   b) Quality of teaching learning processes
   c) Sufficiency of Educational facilities
   d) Research and publication
   e) Quality of outputs
   f) Institutional financial management
2) Periodic subject review: There should be a schedule for periodic subject review which ensures that all programs are reviewed on a rolling cycle.
3) Multi-stakeholder feedback: This would involve incorporating feedback from faculty members, experts, students, alumni, industry, etc. In this context, 'Employer Satisfaction Surveys (ESS)' can be conducted periodically (once in 2-3 years) which can ascertain preferences of employers in terms of skill sets, competencies and attributes that employers seek in students. This can also reveal information on the level of satisfaction of employers of students/trainees. It can indicate factors such as relevance of curriculum and preparedness of the graduates to face the industry. Above all, these surveys can lead to better engagement with industry and provide inputs to improve programs and professional orientation of curriculum.

In order to ensure quality in technical education the Government of Punjab may create Punjab Technical Education Quality Assessment Authority (QAA).This independent authority under Section 25 of the Companies Act, or a Trust under the Societies Act will be responsible for:

1) Assessment of learning outcomes in select competencies in various subjects and skill sets
2) Enable stakeholders to appreciate the need for assessment of quality and to analyze outcomes
3) To make available reports of assessment to educational administrators and to the public for planning, research and analysis.
4) Assessment of curriculum in various courses

5) Apart from assessing learning outcomes, assessment data also serves to inform and strengthen technical education, and to communicate with policy makers, families and other stakeholders.

6) Identify and build success stories like Central Scientific Instruments Organization (CSIO) Centre in Chandigarh for replication and expansion.

An example of a similar system is an outstanding illustration of a large scale learning assessment study by KSQAO that has been carried out under the auspices of a state government and a central government sponsored education scheme. KSQAO could thus be followed as a template to replicate in to a learning assessment study that focuses on measuring learning assessments of students across Punjab.

4.2.2 Enhance flexibility of academic process for technical education courses

To facilitate cross learning, PTU and PSBTE should shift from the existing 'plate-meal' approach where courses for each technical program are fixed to a 'cafeteria' approach where students have opportunities to choose from a variety of courses under broad guidelines. A credit based system has the following features:

1) Enhanced learning opportunities
2) Ability to match students scholastic needs and aspirations
3) Inter-institution transferability of students (following the completion of a semester),
4) Part-completion of an academic program in the institution of enrolment and part-completion in a specialized institution
5) Improvement in educational quality and excellence
6) Flexibility for working students to complete the program over an extended period of time
7) Standardization and comparability of educational programs across the state.

The credit based system imminently fits into the emerging socio-economic milieu, and could effectively respond to the educational and occupational aspirations of the upcoming generations. Aided by modern communication and information technology, the credit based system has a high probability to be operationalized efficiently and effectively - elevating students, institutions, and technical education system in the state to newer heights. For instance, Europe has introduced the European Credit Transfer and Accumulation System (ECTS) to facilitate student mobility.

1) Credits are allocated to all components of a study program (e.g. modules, courses, placements, dissertation work, etc.) and reflect the quantity of work each component required to achieve and its specific learning outcomes.
2) Credits in ECTS can only be obtained after successful completion of the work required and appropriate assessment of the learning outcomes achieved.
3) Student workload in ECTS consists of the time required to complete all learning activities like, attending lectures, seminars, independent and private study, preparation of projects and examinations.
4) Performance of the student is documented by a local/national grade. The ECTS grading scale ranks the students on a statistical basis.

For greater flexibility in the academic process, the current semester-system will have to be combined with a credit-based system. A large number of institutions around the country already have their undergraduate and postgraduate papers subdivided into units and sub-units. In a generalized manner, the sequence of the credit based system would be as follows

Paper ⟶ Unit ⟶ Sub unit ⟶ credits

The implementation of a semester/credit system calls for several interconnected and coordinated steps that will have to be undertaken including the following

1) Flexibility in academic process for higher education may be achieved by combining the current semester system with a credit system. A large number of institutions around the country already have their undergraduate and postgraduate papers subdivided into units and sub-units.

2) Re-configuration and revision of curricula (while the quantum of instructional work of faculty members remains about the same, the number of papers or credits could be at least twice as many). Review of curricular contents (study papers, term papers, assignments', workshop assignments, experiments etc.) of certificate, diploma, undergraduate, postgraduate, M.Phil. and Ph.D. programs.

3) Decision on the number of student-faculty contact hours during a semester in different technical education programs - diploma, undergraduate, postgraduate and doctoral.

4) Determining the amount of work to be completed (or credit points to be earned) by students in undergraduate, postgraduate, M.Phil. and Ph.D. programs.

5) Decision on the time-distribution on class room-work, field-work, laboratory- work, workshop practice and/or other curricular work. Distribution could vary from subject to subject.

6) For the sake of clarity of faculty, students, and examiners, all the curricular contents should be specified and sub-divided into units and if need be into sub-units, which are subsequently assigned numerical values and appropriate credits.

7) Every department to decide on the number of core-credits (mandatory courses) and elective or optional credits for different levels of its academic programs.

8) Decision on the 'total' credits to be earned (or completed) by students undergoing diploma, undergraduate, postgraduate, M.Phil. or Ph.D. programs.
   a) Generally, core-credits would be unique to the program, and earning core-credits would be essential for the completion of the program and eventual certification.
   b) On the other hand, elective-credits are likely to overlap with other programs or disciplines of study (for example, languages, statistics, computer applications, etc.).

9) Students enrolled for a particular program or course would be free to opt and earn elective credits prescribed under the program, or under other programs within the department and university or even outside in another recognized university/institution of higher education.

10) The option for students to pursue dual courses should be explored so that interested and capable students can have an alternate education path.

11) The state needs to deliberate on an acceptable system where all the Universities transition to a credit system. The students wanting to apply to a new university needs to approach the new campus with all the previous academic work completed.

The new campus will evaluate the completed academic work against their course listing. Upon being admitted to the new campus the student will receive a credit evaluation showing how transferred courses equate to courses at the new campus.

12) Students should be given flexibility not only to choose courses within the university but also to take up exchange programs in national/ international universities. Also, since higher education is pursued at a time where students have begun to take on family and personal commitments, the programs should be designed such that the student can take a break from education and re-join later on.

13) It is also suggested that universities transform the existing system of having a one-time evaluation at the end of the year. The system of evaluation should be a continuous process with emphasis on testing understanding and application rather than rote learning.

14) Universities should transition to a credit system. This also forms part of the reform agenda expressed in the eleventh five year plan.

15) Every academic program should mandate completion of minimum number of credits in core subjects. However, students can select elective courses (from a pool of courses) for completing credit requirements of the program.

16) Universities should transform the system of evaluation from a one-time event to a process of continuous evaluation. Such a process of continuous evaluation is possible only at the college level. It will be essential to enhance weightage of internal evaluations by colleges to 30% for 5 years and 50% after that.

17) To enable cross-pollination, universities can introduce a ceiling; say one-half or even one-third, of the proportion of faculty members to be hired from within the university.

18) Universities should establish tie-ups with national/ international universities. This could be the responsibility of the International Relations Office, details of which will be given later on.

19) For programs of long duration, such as engineering and medicine, universities may give students the option to take a break after 2 years and re-join the course within a defined time frame.

4.2.3 Competency framework and sectorial competency models

An important pre-requite for effective lifelong learning paradigm for technical education and industrial training is a comprehensive framework that is agreed upon by both industry and institutes which clearly identifies and defines the competencies - in terms of knowledge, skills and attitude associated with each level in each industry. The Australian Qualification Framework is an example of a framework to define competencies in education and skill training.

The objectives of such a framework would be to

1) Provide state wide consistent recognition of education outcomes
2) Help develop flexible pathways that assist people to move between education and skill training
3) Define competency levels required for different levels of skills

Suggested characteristics of a competency can include breadth, depth and complexity of knowledge and skills and the ability to apply the skills in a work environment. The competency framework would segregate competency levels of skills. For instance, a Certificate 1 can imply basic skills while a Certificate 4 would mean more complex skills. The framework should be consistent with the proposed National Vocational Qualifications Framework in order to ensure nation-wide recognition of training and skill acquisition in Punjab.

Essentially the learner will be offered a basket of courses/programs which he/she should qualify to be certified to possess a certain competency at a certain level. There should be sufficient flexibility offered to the learner to qualify in various courses across institutes and over a period of time.

The system, once stabilized, should mandate that no interested student is denied admission. Instead each student can be placed in a stream of choice and in a program according to his/her aptitude. Based on the performance and ability, the student can reach his/her highest qualification. There should be a provision for graceful exit to students who are unable to cope with academic rigor of a program by providing a lower qualification / certificate. For e.g. a student who enters the a mechanical engineering stream after 12th standard may either pass out as a graduate or a diploma holder after a fixed number of years, say six years, according to the credits earned and competency gained. Suppose the student has acquired the competency level of a diploma and is provided an exit, at a later stage, he should be allowed lateral entry into a graduate program.

The industry/ employer should be involved to specify the detailed job profile based on which the competency set should be identified, which in turn will determine the course curriculum. While the current courses/modules can be mapped to these competencies, in addition, as per the requirement, additional courses/modules need to be added which will improve the employability of the students acquiring these competencies. The curriculum and availability of courses/modules against each competency should be reviewed periodically (every 5 years). The syllabus must be prepared jointly by the industry and the educators simultaneously. It should be regularly updated, at least 20% to be changed every year.

Stakeholders	Basic research	Applied Research	Product Development	Process Development
Government, public enterprises	Medium	Medium	Low	Low
Domestic Companies	Low	Low	Medium	High
Foreign companies	Low	Low	Medium	High
By Sector	Low	Low	Medium	High
ICT	Low	Low	Medium	High
Life Sciences	Low	Low	Medium	High
Engineering and related industries	Low	Low	Medium	Medium
Agriculture, chemicals and Material sciences	Medium	Medium	Medium	Medium

Other R&D and Knowledge processing industry	Low	Low	Medium	High

4.2.4   Create 'Center of Excellence' in emerging technologies:

Centre of Excellence in Emerging Technologies can be housed in one of the top-performing institutes across the state such as IISER, Thapar University, IIT or any State govt. Engineering and Technology Institute. It can be funded by the State Government. The main objective of setting up this CoE is to provide leadership at a state level or district level to create innovation related educational programs through research, professional development, business partnerships and may be if required, give inputs on curriculum development. This Centre can enhance national dialogue in the area of science, technology and innovation, and contributing to industrial upgrading and help identify measures to encourage transfer of technology. It can also help in identifying and evaluating new and emerging Science & Technology sectors. These CoEs can also forge international partnership with Universities abroad performing research which can encourage faculty members and students as well.

The block below shows the allocations made to research by some of the reputed universities of the world

There must be a conscious effort to attract and retain talented faculty. This is necessary because faculty members and researchers are likely to get opportunities which would be far more rewarding monetarily than in research. It will be difficult to match the salary packages they would be offered in the industry. However, at the minimum faculty and researchers should be provided a reasonable remuneration. Along with this a pleasant environment with good facilities and infrastructure in the university campus would be an added attraction.

To encourage faculty and researchers that bring out good quality research outputs such as publications, books and patents, a system of performance incentives should be instituted. At the same time it is essential to clarify the ownership rights of these research outputs. It is suggested that the producer of the research output should be entitled to a share of its benefits. The block below gives an example of a policy in the US for inventions from government-funded research.

Research should not be looked at in isolation, but rather be integrated into the universities offering. Wherever possible, synergies between research and teaching should be explored. PTU should also be pro-active in undertaking research projects for the industry. This could also bring additional income to faculty.

The development of capabilities and exposure to research has to initiate early on for students, so that they seriously consider it as a career option. There should thus be a facility to expose students early to research projects while they pursue graduate education.

1) Universities should allocate at least 10% of funds for research. Funds should be demarcated for pure and applied research. Among applied research funds to be allocated to traditional and emerging areas.

2) Universities should give monetary incentives to faculty and researchers for publications. The incentives should depend not only on the number of publications but also the quality of journals published in.

3) The Punjab government should enact a legislation that creates a uniform legal framework for government funded research and gives universities ownership and patent rights. In the framework, inventors should also receive a share of the royalty.

4) All universities should employ a legal expert to support researchers in the legal procedures for filing a patent (IPR).

5) Universities can introduce faculty-designed courses as elective subjects. Faculty can design such courses to align with their areas of research.

6) Students at the under-graduate/ graduate level should be exposed to short research projects. As part of the graduate curriculum, students can be given the option of taking a research project under the guidance of a faculty member in lieu of a course.

7) Research proposals particularly for basic sciences are different from general project proposals. It is difficult to accurately predict timelines, costs and outcomes of research projects. Head of departments of universities should assess the requirement for additional flexibility. However, any additional flexibility should be accompanied by frequent monitoring.

4.2.5 Reforms in Evaluation

Regarding quality of output the report submitted on examination reforms by the committee under Dr. Salwan, former Vice-Chancellor, PTU can be referred. Some of the key initiatives that can be taken up are

1) Developing a broader framework for evaluation including student displays, projects, seminars, collection of information and reports.

2) Process of continual evaluation that is comprehensive and part and parcel of daily teaching learning process. The system of internal assessment must be strengthened in this context Assessment based on day-to-day activities rather than examination oriented alone. Evaluation in co-curricular activities such as art, games, health, sports, education, social and personal qualities should be part of the overall evaluation.

3) Examinations itself should not be restricted or limited to writing but extended to assessment tool such as observation, discussion, note-taking, recording, collecting opinions of students, to name a few.

4) More open-ended questions allowing the students to think and write and express their views on their own

5) Transparency in the entire evaluation system - internal as well as external assessment and conduct of examination

4.3 Institutional Mechanisms

In order to ensure quality in technical education the Government of Punjab can create Punjab Technical Education Quality Assessment Authority (QAA).This independent authority can be created under Section 25 of the Companies Act, or a Trust under the Societies Act. It is recommended that Joint Working Group on Strengthening Science Education be set up within PTEQAA. This Group can be set up with participation from Department of School Education, PSTEB, PTU and Department of Technical Education in

order to improve the quality of Science Education in schools thereby improving the quality and quantity of science students graduating to higher education. Some of the activities that the Working Group can towards improvement of Science Education include:

1) Improving image of science-related careers in schools
2) Leveraging RMSA interventions related to science education in schools
3) Efforts to draw well-qualified and enthusiastic Science faculty at school level
4) Effective teaching-learning mechanisms such as addition of out-of-classroom contexts to improve learning of science in a more practical way. For instance, observing the night sky for constellations, visits to science museums, etc.
5) Improving the science curriculum and content at the school level with emphasis on practical work
6) Ensuring supply, development, and retention of good science teachers. For instance, incentive should be given to science graduates to become school teachers
7) Strategies for linking research, policy formation, classroom practice, and teacher education must be developed

A Working Group under the TE Policy Planning, Implementation and Monitoring Cell (PPIMC)'can be created for following activities

1) Designing the competency framework and sectorial competency models- in line with the national standards (e.g. National Qualifications Framework) including end of program testing and certification.
2) Commissioning of Student/ Trainee and Employer Surveys to determine quality of training delivery quality and employability of students/trainees from Punjab.

In case of technical education individual universities should design and develop programs to enhance flexibility of academic process for technical education courses and develop a credit based system for the same.

4.3.1 Key Activities and Timelines

Activity	Timeline
Introduction of Quality Assurance Framework	Short Term
Initiation of Institutional Audit	Short Term
Form a Punjab Technical Education Quality Assessment Authority (PTEQAA)	Short Term
Periodic 'Student/Trainee Engagement Surveys', 'Student/Trainee Destination Surveys' and 'Employer Satisfaction Surveys'	Short Term
Formation of Joint Working Group to strengthen Science Education	Short Term
Introduction of credit-based system for technical education courses	Short Term
Implement examination reforms as suggested by the Committee on Examination Reforms for bringing in transparency	Short Term
Provision of multi-entry/multi-exit system for students of all tiers (Diploma/Degree)	Medium Term
Support up-skilling and improving employability of trainees and students	Medium Term
Create 'Centers of Excellence' in emerging technologies	Medium Term
Institute a system of performance incentives to encourage faculty and researcher to bring out research outcomes	Medium Term

4.3.2 Indicative Budget

Activity	Indicative Budget (In Lakhs)
Design and introduction of Quality Assurance Framework	75
Initiation of Institutional Audit (Preparatory work, 50 institutes per tier for one year)	90
Formation of a Punjab Technical Education Quality Assessment Authority (PTEQAA	50
Periodic 'Student/Trainee Engagement Surveys', 'Student/Trainee Destination Surveys' and 'Employer Satisfaction Surveys' (3 studies)	150
Create 'Centers of Excellence' in emerging technologies (3 in one year)	900
Grants for performance incentives to encourage faculty and researcher to bring out research outcomes (2 tiers)	400
Total	1665

4.3.3 Monitoring Indicators

Outputs	Outcomes
Student admission to sanctioned capacity	Satisfaction of graduates with the education received
Student pass-out and employment rates	Satisfaction of employers with the skills of graduates
Learning outcomes of students	Revision of curriculum
Number of students taking up science	Pre and post course wage differentials of SDIcandidates
Internship on-the-job training per student per year	Placement trends for students attending skill bridgecourses

Chapter 5

Detailed Interventions and Implementation Strategy: Infrastructure

5.1 Key Actions:

1) Conduct **periodic skilled manpower demand forecast / capacity assessment studies**
2) **Create a revised admissions policy and incorporate a biannual admissions policy** to improve the access to courses while improving the viability of institutions
3) **Publish 'College Population Index'** to prioritize and plan for capacity additions in underserved regions
4) **Assess the current and short-term** physical infrastructure needs of institutes
5) **Compute and publish a** composite **index 'Infrastructure Index'**
6) **Prepare** infrastructure plans to ensure strengthening of existing infrastructure
7) **Define and implement** a norm for physical access to institutes
8) **Analyse and publish government and private** spending on technical education and industrial training
9) **Position Government institutes** as benchmarks/mentors for other institutes in the region for excellence in education, research, training and capacity building
10) Constitute a **TE 'Policy Planning, Implementation and Monitoring Cell (PPIMC)'** to carry out extensive studies relating to demand assessment and for analyzing and publishing data on manpower needs and occupational forecasts
11) **Constitute a Working Group on Infrastructure** for the purpose of assessment, planning and setting of criteria and standards related to infrastructure

A basic problem that has been identified in Eleventh Five Year Plan document with regards to the skill development system in the country is that the system is non-responsive to labour market, due to a demand-supply mismatch on several counts: numbers, quality and skill types. It is also seen that the inflexibilities in the course/curriculum set-up lead to over-supply in some trades and shortages in others. Of the trained candidates, the labour market outcomes as seen from placement/ absorption rates are reportedly very low. Low-paying capacity of learners and reluctance of industries to train workers for fear of losing them to competition has resulted in chronic deficiency in private investment in this area. These issues were also brought out during our interactions with various stakeholders in Punjab. These factors indicate a need to align the creation skilled manpower in the state to the local and national industry demands.

The expansion of technical education institutions along with intake capacity also needs to be checked to ensure that whilst the capacity is adequate to meet the GER target of 22% by 2017(Twelfth Five Year Plan), the capacity additions do not lead to large vacancy woes, a scenario common in the engineering colleges and polytechnics. In addition, regional imbalance, if unaddressed, can have implications on socio-economic development of regions. Well-educated and talented students migrate to well performing districts, many of them take up employment and contribute to economy in those districts.

The issue of inadequate infrastructure was brought out during our interactions with various stakeholders in Punjab. These factors indicate a need to periodically review the growing infrastructure demands as well as check the capacity additions based on the regional imbalances.

5.2 Detailed Interventions

5.2.1 Periodic skilled/ technical manpower assessment studies

Periodic (once in 3 years) assessments of the sector-wise skilled/technical manpower requirements of the state should be the key input in the introduction of new institutes and new courses in existing institutes. Such assessment studies would require close collaboration with industry. There should be an institutionalized mechanism for local enterprises to provide input regarding their manpower demand as part of such assessments. Hitherto neglected sectors such as Rubber Industry, Leather Industry etc. should also be involved in this exercise.

The results from these studies should be mapped against then existing capacities and admission trends for various courses at each tier of technical education and industrial training under each sector. This will constitute the state technical manpower inventory. The gaps between the requirement and the inventories would be the determinant of technical manpower deficit/ surplus for each level in the state and result in specific interventions to address these gaps/surpluses.

In collaboration with the Department of Industries/ Employment, industry bodies and representative enterprises (public and private) from the identified high-growth sectors in the Punjab, sector specific skilled/technical manpower demand assessment should be conducted.

"List of Twenty High Growth Sectors (as per 11 FYP): 1. Automobile and Auto-components, 2. Banking/Insurance and Finance Services, 3. Building and Construction Industry, 4. Chemicals and Pharmaceuticals, 5. Construction Materials/Building Hardware etc., 6. Educational and Skill Development Services, 7. Electronics Hardware, 8. Food Processing/Cold Chain/Refrigeration, 9. Furniture and Furnishings, 10. Gem and Jewellery, 11.Health Care Services, 12.ITES or BPO, 13.ITS or Software Services/Products, 14.Leather and Leather goods, 15.Media, Entertainment, Broadcasting, Content Creation and Animation, 16. Organised Retail, 17.Real Estate Services, 18. Textiles, Apparel and Garments, 19. Tourism, Hospitality and Travel Trade, 20. Transportation Logistics, Warehousing and Packaging etc.

Accordingly, a state wide survey can be conducted to determine employment potential and detailed technical/skilled manpower forecasts by sector at different levels (corresponding to diploma holders, graduates, etc.). Region wise break-up of demand should also be determined for each sector.

Eventually, a database for occupational forecasts can also be evolved. These inputs can also feed into the state Employment Policy apart from better technical manpower planning.

1) Over a period of time the skilled/technical manpower demand assessments can be extended to national and global labour demand with a focus on select countries like Canada, United Kingdom and Australia to align the sanctioned capacity across trades and courses to country/ global needs. For this purpose collaboration with foreign institutions and certifying bodies can also be explored to ensure the immediate employability of youth from Punjab in these countries. Accordingly, courses and programs which increase overseas mobility of students should be offered.

2) A standard assessment approach and methodology needs to be developed so that the results from various assessments can be combined and compared. Similarly uniform data collection formats should be created such that the data can be uploaded in a TE Management Information System.

3) Based on the current capacity of technical education and industrial training in the state future requirements in institutions in terms of seats in various courses at each level, instructors/faculty, infrastructure can be estimated. This can serve as a justification for any capacity addition.

4) In addition to the AICTE approved courses, the state may also recognize non-AICTE Program as well which address gaps in specific sectors.

On the basis of the results some of the steps that can be taken up are:

1) A list of recommended courses should be prepared for every district/region. All government institutions should offer skill courses based on this list.

   Special programs for niche areas requiring specific courses/training can also be identified. For e.g. with metro rail services coming up across the country, there may be the need for technical manpower specially qualified in various disciplines relating to Metro technology.

2) In case of excess capacity in some engineering and polytechnic courses changes to the admission policy can be considered including

   a) Biannual admission calendar to increase points of entry for students. This will need changes in the structuring of programs in terms of credits rather than a fixed set of courses. The validity of the entrance exam rankings, etc. also needs to be updated. Such a step will improve the access to these courses while improving the viability of institutions.

   b) The current reservation norm for domiciled candidates is designed for a (local) demand surplus scenario. The state had an interest in providing preference to students from within Punjab as the number of seats was insufficient relative to the number of students from Punjab opting for engineering/ diploma. This was the case before private engineering colleges mushroomed in the state creating an excess number of sanctioned seats.

Hence the admission policy needs to be suitably revised to the scenario of high capacity. For e.g. based on historic admission trends the colleges and polytechnics should be categorized according to the local demand. Institutions with lower local demand should be allowed to induct a larger percentage of students from outside Punjab. The categorizations should be revised every 2-3 years.

1) To provide an indicator for regional access to education the state should publish 'College Population Index' at each level. CPI measures the college per lakh population in the relevant age group for each district and the state. While the CPIs should increase over a period of time the deviation among CPIs of various districts/ regions should also be tracked to measure the regional imbalance.

   For instance CPI (engineering college) can be calculated to be:

   CPI = Number of educational institutions offering engineering degree in District 'X' divided by' Total Population in 18-23 years of age in District 'X' 'multiplied by' 100,000

This will help to prioritize and plan capacity addition of institutions (Polytechnics or Engineering colleges or Management or Pharmacy colleges) in underserved regions to bring the unskilled/ unqualified manpower from these regions with the mainstream workforce.

Based on the assessment studies mentioned above and the CPI a cap may be considered for the maximum number of seats for the institutes in each region to create regional balance both in private and government sector

5.2.2 Infrastructure Assessment and Planning

There is a need for a detailed assessment of the current physical infrastructure at each institute (Government/Private) to understand the current and short term needs. A data collection format of required facilities should be prepared and the information collected during the assessment should be entered and updated in the TE MIS and thereafter lead to calculation and publication of a composite index of the indicators: 'Infrastructure Index'. The performance on the infrastructure index should also contribute to the rating/accreditation of the institute.

The assessment should broadly cover the following aspects of infrastructure both in terms of availability and maintenance

1) Physical and Teaching Infrastructure: Classrooms/ Training rooms, Projectors, Audio Visual aids, Seminar Hall,
2) Student Facilities- Drinking Water facility, Rest rooms, Hostels, Transport, and Canteen etc.
3) Laboratory Infrastructure: Workshops, Machinery and Equipment, Raw Material, Research facilities, Animal House (for pharmacy courses), Studio/Material Museum (for Architecture), Kitchen and Restaurant (in case of Hotel Management and Catering Technology), etc.
4) Administrative Infrastructure: Principal/Director Office, Board room, Department Offices, Faculty Rooms, Training and Placement offices etc.
5) Sports and Recreational Infrastructure: Playgrounds, auditorium, etc.
6) Academic Infrastructure: Library facilities (including books, journals, e-journals), Computer facilities (including software, internet access, printers), etc.

Based on the assessment the respective institutes should prepare an infrastructure plan (updated annually) for strengthening existing infrastructure (short-term, medium-term and long-term).Priorities should be established with sufficient regard to immediate needs and the probable directions of future expansion based on the results of assessment studies and guided by identified norms on infrastructure. Training Centers and institutes should be set up by the government in under-served areas (backward districts, minority concentrated areas, border areas, SC/ST concentrated areas, hilly/difficult areas, and other un-served areas). New training centers could be set up in conjunction with the schemes of the Department of Women & Child Development, and Department of Minorities/ Social Welfare.

Currently, there is no norm for physical access and one can make inferences only based on whether districts have colleges. The state should define and implement a norm for physical access to institutes. Standards and norms for physical infrastructure should be

framed subject to periodic review and evaluation for physical facilities, buildings, libraries, workshop layouts, quality and type of equipment. For e.g. provision of hostel accommodation, particularly for students with a poor economic background, would be critical to enable them to make a choice of college. In terms of hostel facility, all institutes should be mandated to have hostel facility to cover a minimum proportion (say 10%) of seats. At least 50% of hostel accommodation should be for women.

The criteria and standards must allow for maximum efficiency and flexibility by giving due regard to the purpose of the facilities and local conditions. The standards should be designed in collaboration with specialists from industry, teachers and educational architects taking into account the national standards set by AICTE etc.

For government institutes funds should be allocated to refurbish existing assets allowing for adequate funds for recurrent expenditure for supplies and maintenance and repair of equipment. It should be ensured that, based on accepted norm, a percentage of the capital cost is allocated annually for maintenance and repair.

Private institutes should submit annual reports on compliance to infrastructure standards along with proposals for government aid for infrastructure improvement. Based on the performance and rating of the institute, government can consider partial funding (through loans and/or grants) of capital assets in private institutes. The developmental needs of the institutes will have to be justified by determining impact on infrastructure index of the institute.

Over a period of time, sanctioning of admissions at an institute should be linked to the compliance of the standards at that institute. Similarly, new institutes should satisfy the basic infrastructure requirements including availability of land and construction of buildings, availability of electricity, etc. as per the identified standards and criteria before commencing operations.

Once infrastructure is created, government institutes should be given autonomy in their Administration and financial management as far as infrastructure is concerned. For e.g. maintenance of facilities and equipment, decision on disposal of unserviceable and obsolete equipment, training of faculty on new equipment should be decentralized.

5.2.3   Budgetary analysis and Critical Skills Development Fund

An analysis of the budgetary support/spend on technical education and industrial training should be published annually at a state level which provides details of the percentage spend along components such as Infrastructure, Repairs and Maintenance, Faculty Development, Research, Quality improvement, Accreditation, etc. This publication should provide details of the Plan and Non Plan budgeted expenditure (for central and state schemes) by the Department of Technical Education in comparison to other states and the center.

Regarding government support to institutes, the presence of government institutes can act as a bench mark for other institutes in the region on excellence in education, research and capacity building. While the government polytechnics do serve this purpose presently, in case of engineering degree level, the proposed Punjab Institutes of Technology (PIT)/ Multi-Disciplinary Academies (MDA) can be positioned to establish the standards of

quality and excellence in graduate and post graduate education and research. It should be appreciated that such institutes may take time to grow into centers of excellence. The UGC scheme of "Colleges with Potential for Excellence" (CPE) is an example of such an initiative. In addition, the DoTE can also coordinate with the School Education Department and Higher Education Department to compare the spending on primary, secondary and tertiary education.

A critical skill development fund (CSDF) can be instituted to promote skill-sets relevant growth of economy and job market requirement as determined by surveys mentioned above. Government funding should focus on areas like research funding, research grants, faculty development initiatives, etc. which address the overall quality of technical education in Punjab. Another deficit skill relates to the technical design capability. There is a need for focused Design Education as a part of Technical Education at all levels (Degree/Polytechnic). This will be key for promotion of entrepreneurship and manufacturing sector in the state.

Given the propensity of service sector to create more jobs in the future, the CSDF can be used to promote courses in the industries in the service sector. These courses can be identified on the basis of the assessment studies mentioned above. Sectors that can be taken up can include Real Estate Management, Construction Management, etc.

Based on the inputs from the stakeholders, the state can consider building an institute focused on Planning and Architecture, which can offer diploma, graduate and post-graduate courses in the field of Architecture and Planning.

The fund can be set up in partnership with industry and used for training and up-skilling of existing workers to meet the requisite demands. These funds can also be used towards the following:

1) Development of capacity in institutes, corresponding curriculum, faculty development
2) Training and placement of job seekers into vacant positions, and requisite up-skill existing workers to meet new business demands
3) Fee support for students

5.3   Institutional Mechanisms

For the above mentioned activities the following institutional structures may be constituted.

5.3.1   TE 'Policy Planning, Implementation and Monitoring Cell (PPIMC)'

The state may consider forming a separate TE 'Policy Planning, Implementation and Monitoring Cell (PPIMC)' to carry extensive studies relating to demand assessment and for analyzing and publishing data on manpower needs and occupational forecasts. A cell should also play an advisory role for periodic policy revision.

The PPIMC can function either within the department or as an independent authority under Section 25 of the Companies Act, or a Trust under the Societies Act with representation of DoTE, PTU,PSTEB apart from Departments of Higher Education, Industry,

Employment &Planning and DGET/AICTE's regional offices in its governance body. The cell should be staffed with professionals/consultants in education and training, statistics and economics.

The proposed authority will be chaired by the Chief secretary with members including bureaucrats, subject experts from research organizations and representatives from nongovernmental organizations.

The findings of the independent evaluation will be reported to the state government and also placed in the public domain. The outcome of the evaluation will be used to improve program design and delivery. The authority will be a registered society with its own rules, regulations, finances, procedures and personnel.

Experts in public administration, management, academics, civil society, among others will be appointed to take up evaluation work, according to sources. The authority will be supported with Rs 10 Crores financial grant by the state government for the discharge of its functions.

The PPIMC can have the following functions

1) Commissioning the sector specific skill assessment studies and advising policy revision based on the results of these studies. Till the capacity to carry out the studies is built in the cell, such studies may be carried by external agencies.
   These reports and findings should be published in the public website so that the manpower planning by industries is facilitated.
   A clear, time-bound plan for various assessments should be published every year.
2) The PPIMC can carry out the budgetary analysis and advice the government on the areas where the CSDF can be channelized.
3) Separate working groups on access, infrastructure and instructor/faculty development can be formed under the PPIMC to focus on respective dimensions of training/education.
4) The PPIMC will provide administrative and procurement support to all the working groups for conducting specific consulting studies that may be required from time to time.

There should be efforts to engage the leadership (administrative and political) to make data based informed decision.

5.3.2   Working Group for Infrastructure

For the purpose of assessment, planning and setting of criteria and standards related to Infrastructure a working group with representatives from works departments like Public Works Department (PWD), institutes and industry bodies may be constituted. For setting the standard and norms with respect to machinery and equipment for each trade relevant skill councils should be consulted. The group can also advise the government on the facilities management of government polytechnics.

Once a detailed assessment of the current physical infrastructure at each institute (Government/Private) is carried out, the group should advise the government in the sanctioning of funds based on the identified norms and priorities.

For other working groups the function and roles are explained in the respective sections.

5.3.3 Key Activities and Timelines

Activity	Timeline
Formation of 'Working Group on Infrastructure'	Short-term
Constitute a TE 'Policy Planning, Implementation and Monitoring Cell (PPIMC)'	Short-term
Linking admission and approval of new institutes to compliance to infrastructure standards at that institute	Medium-term
Revision of admissions policy	Medium-term
Introduction of biannual admissions process	Medium-term
Publish 'College Population Index' to prioritize and plan for capacity additions in underserved regions	Medium-term
Periodic assessment studies of the sector-wise skilled/technical manpower requirements	Medium-term
Definition and implementation of a norm for physical access to institutes	Medium-term
Analysis and publication of budgetary spend on TE	Medium-term
Assessment of current infrastructure in polytechnics, technical institutes	Medium-term
Design of standards and norms for physical infrastructure	Medium-term
Creation of infrastructure plan (updated annually) for strengthening existing infrastructure	Medium-term
Creation of a critical skill development fund	Medium-term
Positioning of Government institutes/MDAs as benchmarks/mentors for other institutes in the region	Medium-term

5.3.4 Indicative Budget

Activity	Indicative Budget (In Lakhs)
Sector wise assessment studies of the skilled/technical manpower requirements (for 10 sectors, one cycle)	200
State-wide survey to determine employment potential (one cycle)	30
State wide assessment of current infrastructure and creation of infrastructure plan(for 2 tiers of TE)	90
Critical skill development fund (CSDF) (for 3 sectors/ skills, one year)	900
Staffing/ Consultancy cost of TE 'Policy Planning, Implementation and Monitoring Cell (PPIMC)' (one year)	50
Total	1270

5.3.5 Monitoring Indicators

Outputs	Outcomes
Number of assessment studies carried out in the last three years	Region-wise skill deficits/ surpluses for each level in each sector
Number of surveys carried out in the last three Years	Number of new institutes opened in the last year
Funds allocated for CSDF	District-wise/Region-wise improvement of score of CPI

Chapter 6

Detailed Interventions and Implementation Strategy: Faculty

6.1 Key Actions:

1) *Introduce strategic initiatives to **address faculty/trainer shortage***
2) ***Conduct** an assessment **of the region-wise and branch-wise vacancy** among faculty or field staff*
3) *Implement a **rational merit based transfer policy** of faculty encouraging services in rural areas.*
4) ***Initiate** the concept of a state-wide **'faculty bank'***
5) *Undertake **rapid recruitment drives and fast track recruitment strategies***
6) *Conduct **State Technical Education Eligibility Test to recruit the entry-level qualified** (Bachelor of Engineering or Bachelor of Technology graduates) **graduates***
7) *Introduce **mandatory trainings such as two-week Induction Training Program (ITP) or Pre-Service Training for faculty** to enable the young teachers to better orient and equip themselves for the teaching profession*
8) *Launch a **six-month certificate course on technical teacher training** for diploma students during the final year to take up teaching career*
9) *Roll-out **Future Faculty Program(FFP)** to identify potential faculty members amongst PhD students from the PTU system*
10) *Introduce an **integrated Bachelors/Masters Program** for students who would like to take up teaching positions/ career.*
11) *Conduct **upgradation of qualification** through technology-enabled distance learning and identify mentor institutions*
12) *Create a **separate cadre of administrators** headed by a senior faculty member to assist the Principal in day-to-day work of administrative nature*
13) *Design an **extensive Faculty/Instructor development program (FDP/IDP) in collaboration with the respective industry's sector skill council***
14) ***Explore partnerships with** employers (public sector and private enterprises) for providing **industry representatives to train the faculty***
15) *Introduce a **comprehensive performance appraisal** system for faculty and administrators*
16) *Create a **Working Group on Faculty** within TE 'Policy Planning, Implementation and Monitoring Cell (PPIMC)'*
17) *Constitute a separate **Faculty Recruitment Board** within PTU and PSTEB*
18) *Set up a **'Faculty Development Cell' (FDC)** within the upcoming State Institute of Technical Teachers Training and Research (SITTTR) to design and develop Faculty Development Programs*

Since quality of faculty has been reported to be of concern in both the workshops as well as one-to-one interactions, there is a need to put in a place a system of recruiting well-qualified eligible faculty instead of ad-hoc recruitments. As the initiatives related to assessment of skill demand and matching of courses to address skill gaps take shape, the need for faculty will also emerge. Further, capacity upgradation by up-skilling and re -skilling current instructors will be necessary.

A recent World Bank report on Governance of Technical Education (2010) also recommends putting a proper framework for faculty appraisal/faculty development scheme including training, needs analysis and funding. The report also stresses on the usage of technology for effective delivery of courses and support for research.

6.2   Detailed Interventions

6.2.1   Strategic initiatives to address faculty shortage

Across many institutions, the problem of serious shortage of faculty has been identified in both polytechnics and technical education institutes. Recently, many institutions have undertaken expansion, and have found that faculty recruitment has been quite difficult, with variations across institutes as well as across disciplines. To address the shortage of faculty in institutes with the increase in enrolment and institutes following steps should be taken

1) An assessment of the region-wise and branch-wise vacancy among faculty or field staff (for colleges, polytechnic) including the gender ratio and qualifications of the current faculty at various levels in institutes should be conducted. This data should be collected regularly and populated in the TE MIS (discussed later). This data can help the department effectively plan for faculty recruitment (full-time and part-time). Over the medium term a state wide faculty 'bank' can be maintained and all institutes can recruit faculty from this list.
   Based on the assessment, faculty recruitment through recruitment drives, identification and grooming of qualified faculty among pass-outs should be carried out.
   In addition, the state can also consider implementing a rational merit based transfer policy of faculty encouraging services in rural areas.
2) To cope with enhanced activities, existing vacancies in all institutes must be filled through rapid recruitment drives. Fast track recruitment strategies along with attractive packages including handsome joining allowance, relocation grant, and job for spouse, assured admission for children, etc. may be adopted. In addition, the attractiveness of the faculty post can be enhanced by allowing faculty members to participate and benefit in the internal revenue generation activities of the institute like providing support to local industries, taking up research, consultancy work, etc. A similar mechanism can be worked out for polytechnics as well. In a phased manner the recruitment of faculty at well performing institutes can be decentralized through the following initiatives
   a) As far as engineering colleges are concerned, industry persons (for short-term or course-based) may be recruited by the management/Board of Governors of the institute.
   b) Government Polytechnics should be given enough flexibility to decide upon the compensation package of the faculty, including leased housing. Attractive performance based incentives may be given even outside the defined salary structure. The respective management authorities may be empowered to take decisions in this behalf.
   c) In addition, Professionals with Ph.D./M.Tech. from reputed industries, private sector, R&D establishments, Defense, PSUs etc., with proven track record on

research, design, manufacturing and occupying senior positions (Professor or equivalent) may be appointed as Adjunct Professor on invitation. An Adjunct Professor would plan, and organize and teach up to 50 percent of a subject. The remaining will be handled by a regular faculty member. The respective Board of Governors may be empowered to take decisions in this behalf.

d) The retirement age of the existing faculty should be immediately raised to 65 years, subject to an internal review by the Board of Governors. The Institutes should be allowed to reemploy retired faculty up to the age of 70 years on terms to be determined by each Board.

3) To ensure that the quality of faculty is regulated at the time of recruitment, it should be ensured that the recruitment of faculty is based on theoretical knowledge, technical and pedagogical skills as well as being abreast with new technologies in the workplace.

a) A State Technical Education Eligibility Test should be conducted to recruit the entry-level qualified (Bachelor of Engineering or Bachelor of Technology graduates) along the lines of National Eligibility Test/State Eligibility Test was conducted by University Grants Commission(UGC) for recruitment and appointment of lecturers in universities, colleges or institutions.

b) For newly recruited fresh faculty members, the state should mandate faculty to attend two week Induction Training Program (ITP) or Pre-Service Training that would enable the young teachers to better orient and equip themselves for the teaching profession. The proposed ITP/Pre-Service training may include Essential Teaching Workshops that would provide educators with an opportunity to improve their teaching abilities. The workshops would focus on basic skills and includes Principles of effective teaching and learning, Learning styles, Communication Skills, Development of interpersonal skills with students, to name a few. The Department already has a 'Training Policy' which entails the guiding principles for training of employees. The training programs can be designed to cater to the objectives stated in the training policy.

c) In addition, college wise 'mentors list' may be prepared to provide assistance to the students to address faculty shortages as an interim arrangement.

4) In the medium to long term, the following strategies may be adopted to prepare for increased demand forecasted in the future

a) A six month certificate course on technical teacher training can be offered to diploma students during the final year. This can be an alternative to the entrance test mentioned above.

Such a program should include courses on teachers training, pedagogy, and technical subjects which can be offered to interested students from polytechnics who are interested in applying for faculty posts. The following modules can be considered as part of the program:

☐ Principles of learning

☐ Lesson planning and preparation

☐ Instructional methods and training aids

☐ Teaching and learning resources

☐ Assessing learner performance

☐ Course development

☐ Principles of effective communication

☐ Trainers roles and responsibilities

All those who have enrolled for a diploma program should be provided an option to attend the teacher training program, whether in government aided or private institutions at a nominal fee. This fee may be refunded if they join an institute within Punjab after completion of the course.

The choice of subject should be given to the student with certain conditions e.g. science subjects can only be taught by those with diploma in science stream, etc. The teacher training program should be modular so that the student can complete the course over a period of time during summer and winter vacations, etc. The following factors can be considered for trade selection and capacity estimation

☐ Identification of the courses which will have future demand.

☐ Determine the average annual requirement of faculty on account of
  Superannuation and change of jobs

☐ Determine the requirement of trainers on account of new proposed
  Schemes

☐ Discussions with institutes and PSBTE on qualitative aspects of the
  Training required.

a) As far technical degree institutes are concerned, potential faculty members especially the PhD students should be identified and motivated to apply for faculty posts. The interested PhD students can be enrolled in to a 'Future Faculty Program' (FFP). This FFP will address the full scope of faculty roles and responsibilities that include teaching, research, and service, emphasizing how the expectations for these responsibilities often differ in different campus settings.

b) Introduction of an integrated Bachelors/Masters Program for students who would like to take up teaching positions can also be considered. Students, under this program, can be trained to become the future faculty in the technical education system. This will be equivalent to Post-Graduate Program in Technical Teacher Education. The four-year Bachelor's degree can be extended to a five-year Program and the students can be trained in areas such as teaching, research, and pedagogy, soft skills etc. beyond technical subjects.

6.2.2 Faculty Development and Trainings

There is a need for targeted Skill Development Programs for Faculty at all levels. The state should allocate a minimum budget in the annual department budget for faculty development. The following steps can be adopted for improving training opportunities for faculty polytechnics and degree institutions,

1) An extensive faculty development program (FDP/IDP) should be designed, in collaboration with the respective industry's sector skill council. The program should include pre service and in-service training both on the trade as well as teaching methodology. It should also include short-term refresher courses in modern

technology and latest fields of knowledge. These faculty development initiatives should be extended to private institutes at nominal fees.

The program should be designed in modules that can be scheduled for 3-4 weeks in a semester, so that flexibility is offered to the faculty members to avail the training.

2) As per the Training Policy of the Technical Education Wing, Training Needs Analysis (TNA) maybe conducted before the faculty is sent for training and development. This exercise needs to be periodically conducted (once every 2 years) and then finalize training slots for individuals for a pre-determined training cycle.

3) Once the trainings are complete, training institutes should evaluate the trainees to gauge the effectiveness of faculty. Faculty should be evaluated using observation, questionnaire, interview, self-diary, etc. (as mentioned in the Training Policy).

4) Partnerships with employers (public sector and private enterprises) - for providing industry representatives to train the faculty should be explored. In addition, two-way sabbatical exchange program between industry and institutes should be established. This can be part of a larger scope of industry collaboration which includes advice on curriculum setting, participate in industry sector skills councils, etc.

5) One option that can be explored is mandatory regular industry exposure for faculty. For e.g. all the faculty members may be required undergo at least one month training / interaction with the industry every 4 yrs. During this period, the faculty members should complete one project in collaboration with the industry based on the new technology developed in industry in last 4 yrs.

6) Over the medium term a virtual learning system can be established that will offer PG degree using flexible credit system and admission should be available to teachers. The courses will deal not only in technical subjects but also pedagogy, Counseling and communication skills. The course will cover various disciplines within Technical Education (under AICTE). Public Private Partnership can be explored in establishing and managing the scheme. The partner institutes, which develop the teaching and learning material, would also assist in delivery and dissemination.

7) Since there is just one NITTTR in the state which caters not only to Punjab, but also the entire Northern Region for implementation of QIP (Quality Improvement Programs) it is important to identify and involve mentor institutions for catering to up-gradation of qualifications of faculty members from degree colleges in engineering disciplines, to acquire Master's and Doctoral degrees. The proposed PITs/MDAs can be positioned to play the role of mentor institutions. Each of these mentor institutions will act as a nodal institution for a cluster of about 10 engineering colleges in their proximity and provide two-year M.E/M.Tech. Programs in the disciplines where they have adequate facilities. Mentor institutions as a system can also serve to develop new curriculum and learning resources for college teachers. They also encourage and sponsor academic-industry exchange programs in which faculty members can spend a short period with some organizations and similarly practitioners can spend a short period in academia.

8) The rating/ accreditation of an institute should be linked to the participation and performance of the faculty from the institute in the Faculty/ Instructor Development Programs (FDP/ IDP). E.g. minimum training days per annum should be specified for all faculty members. The AICTE incentives for faculty and research can be referred in this context.

In addition following initiatives/ incentives can be considered to raise the standard of training/education delivery from a faculty perspective

1) During the period of service, in government institutes, faculty should be encouraged to qualify themselves by associating senior posts to higher qualifications for e.g. Faculty at polytechnics and colleges should be encouraged to upgrade and acquire PG qualifications.

2) Institution of award for individual faculty members and technical institutions which can be named as 'Best Technical Teacher Award for Excellence in Technical Education' as well as 'Best Technical Institute Award'. The schemes of awarding best technical teachers and best technical institution awards would definitely enhance and boost the morale of the faculty/instructors in achieving the overall excellence in their respective fields.

3) Faculty should be encouraged to focus on the Final Year Project of Students in terms of Guidance on Project Conception, Design, Development, Proto-typing, and Commercial Viability Assessment, Monitoring & Evaluation, etc.

4) Teaching aids, especially for industrial training, need to be created such that they highlight the necessary skills/competencies required to master a particular subject at the end of each course for e.g. Guidelines/Workbooks for practical courses at all levels need to be created.

5) To improve the exposure of faculty and other decision makers in the system regarding innovative practices, interaction with other states/ countries should be promoted.

6) Institutions should actively encourage and support the faculty in taking up consultancy (and testing) work. Teachers should actively liaise with industry to attract projects, particularly those which have elements of industrial problem-solving, student involvement and educative value. There would not be any limit on the quantum of consultancy work a teacher can take up or there remuneration he can earn, so long as this is done with the concurrence of the Competent Authority and without prejudice to the other duties and responsibilities of the teacher or to the interest of the institution and the students. While working out the fees/ charges for carrying out the consultancy project, suitable methods of estimation should be used. These would include either fixing a percentage of the total cost of the project as may be in the case of Architectural projects or Structural Engineering Design projects or estimates worked out on the basis of required man-hour input at different levels and expenditure to be incurred on purchase of materials, use of outside labour, use of outside consultants, computer charges, etc.

The pattern for revenue sharing (After meeting all expenses) can be fixed by institutions taking part in the Scheme. This scheme can provide recognition to the Institute and its staff for rendering a much needed service of a specialized nature in the scientific and technological fields.

A comprehensive performance appraisal system for faculty and administrators, with incentives for better performance, should be implemented. This system should include parameters like attendance, training attended, internal revenue generation, industry interaction, success rate of trainees etc.

The performance appraisal system should provide instructors, faculty and administrators with meaningful appraisals that encourage professional learning and growth. The process should be designed to foster development and identify opportunities for additional support where required.

As part of the system a Performance Appraisal Manual should be created containing the following
a) Clear responsibility matrix for conducting the appraisal for each level/ grade
b) Frequency of appraisals and scheduling
c) Competency statements stating the teaching standards and expectations of performance
d) Annual Learning plan including mandatory and option programs
e) Components of appraisal including- classroom observations
f) Performance ratings and incentives associated with each rating
g) Report formats and documentation requirements

This information can also reside in the TE MIS.

6.3   Institutional Mechanisms

For the purpose of assessment, planning and setting of criteria for recruitment, faculty development and performance appraisal related to faculty a working group under the TE 'Policy Planning, Implementation and Monitoring Cell (PPIMC)' with representatives from DTE, PTU, PSBTE prominent institutes and industry bodies may be constituted. The group can also advise the government on the aspects like internal revenue generation, faculty consultancy, performance management etc. for government polytechnics and colleges.

In order to conduct recruitments through the examination process, a separate Faculty Recruitment Board within PTU and PSTEB can be constituted which primarily deals with the recruitment process and the examination. Such a Board can be housed either as part of the proposed State Institute of Technical Teacher Training and Research (SITTTR) or as a separate institution within PTU/PSTEB. The Recruitment Board can also assist with roll out of the two-way sabbatical exchange program. The Recruitment Board will primarily deal with the faculty recruitment process and the examination. The Board can have eminent academicians (probably retired academicians and professors) who can entrusted with this task of conducting examinations and personal interviews before finalizing the candidates to ensure quality faculty are recruited. The Board with support of other teams from PTU, PSBTE can also conduct recruitment drives in institutions to recruit teachers and create awareness about faculty recruitment, development opportunities for students interested in taking up a career in teaching.

For up-gradation of faculty development and trainings, a 'Faculty Development Cell' (FDC) can be housed within the upcoming State Institute of Technical Teachers Training and Research (SITTTR) to design and develop the Faculty Development Programs such as Induction Program (IP) for technical education. The FDC can also guide respective institutions for recruitment of short-term/adjunct faculty, two-way sabbatical exchange program and other initiatives. All pre-service and in-service faculty development programs can be delivered at either NITTTR (Chandigarh), SITTTR or mentor institutions (discussed

above). In case of lack of Infrastructural facilities, support for Video/Web-based trainings and resources can be offered to faculty in their respective institutions itself. In addition, for each major stream of engineering, the recruited faculty should obtain learning material modules from NITTTR to upgrade their skills on a regular basis.

6.3.1 Key Activities and Timelines

Activity	Timeline
Region-wise and branch-wise vacancy assessment among faculty/field staff	Short-term
Rapid recruitment drives for faculty recruitment	Short-term
Introduction of fast track recruitment strategies	Short-term
Conduct of State Technical Education Eligibility Test to recruit the entry-level qualified	Short-term
Introduction of mandatory trainings such as ITP/Pre-service Training for faculty	Short-term
Identify mentor institutions for launch of technology-enabled distance learning	Short-term
Create a Working Group on Faculty within TE 'Policy Planning, Implementation and Monitoring Cell (PPIMC)'	Short-term
Constitute a separate Faculty Recruitment Board within PTU and PSTEB	Short-term
Design an extensive Faculty/Instructor development program (FDP/IDP) in collaboration with the respective industry's sector skill council	Medium Term
Creation of a separate cadre of administrators	Medium Term
Initiate concept of 'faculty bank'	Medium Term
Launch of a six-month certificate course on technical teacher training can be offered to diploma students during the final year	Medium Term
Roll-out of Future Faculty Program(FFP) to identify potential faculty members for PhD students from the PTU system	Medium Term
Introduction of an integrated Bachelors/Masters Program for students who would like to take up teaching positions	Medium Term
Launch of technology-enabled distance learning for up-gradation of qualification	Medium Term
Partnerships with employers (public sector and private enterprises) for providing industry representatives to train the faculty	Medium Term
Introduction of a comprehensive performance appraisal system	Medium Term
Setting up of a 'Faculty Development Cell' (FDC) within the upcoming State Institute of Technical Teachers Training and Research (SITTTR) to design and develop Faculty Development Programs	Long Term

6.3.2 Indicative Budget

Activity	Indicative Budget (in lakhs)
Region-wise and branch-wise vacancy assessment among faculty/field staff (one cycle)	30
Conducting State Technical Education Eligibility Test to recruit the entry-level	50

qualified faculty (for one test, for diploma and engineering)	
Constitution, staffing of Faculty Recruitment Board for PTU and PSTEB (one year)	50
Design of Faculty development program (FDP) in collaboration with the respective industry's sector skill council	100
Implementation of Faculty Development Program for about 1/3rd of Faculty in Polytechnics/Colleges (one year)	250
Design of a six-month certificate course on technical teacher training for diploma students during the final year	50
Design of an integrated Bachelors/Master's Program for students interested in teaching careers	50
Introduction of comprehensive performance appraisal system for faculty and administrators	30
Setting up of a 'Faculty Development Cell' (FDC) within the upcoming State Institute of Technical Teachers Training and Research (SITTTR) to design and develop Faculty Development Programs	50
TOTAL	660

6.3.3 Monitoring Indicators

Outputs	*Outcomes*
Number of faculty trained per month/year	Number of faculty/instructor vacancies in government and private institutes
Average number of training days per faculty per year	Average performance of instructor in the institute as determined by the performance measurement system for department staff
Average number of days of deputation of faculty in industry per year	Institute wise faculty and employer satisfaction(related to training quality)
Number of faculty recruited through the eligibility test, through FFP, etc.	Number of international publications by faculty
Budget allocation on faculty development	Number of faculty vacancies

Chapter 7

Detailed Interventions and Implementation Strategy: Industry Interaction

7.1 Key Actions:

1) *Explore **co-branding** of **courses** to engage private companies in various sectors for Diploma*
2) ***Set up events** such as 'Higher Education Workplace Skill Olympiads' and Business Process Council to enhance the number of industry- institute interactions*
3) *Design and Implement **Entrepreneurship Awareness and Development Programs***
4) *Create **State Entrepreneurship and Placement Cell** (SEPC)*
5) *Set up **Technology Entrepreneurs Parks (TEP)** in each district*
6) *Implement schemes to provide **financial support** and **access to equipment and facilities** at the institutes*
7) *Create **a research forum that fosters** dialogue between various stakeholders*
8) *Set-up **Research Laboratory and Knowledge Resource Centre** either at the upcoming Multi-Disciplinary Academies or at the State Institute of Technical Teachers Training and Research Centre with grants from the State Government*
9) *Organize **research funds for colleges***

Most graduates of higher education seek employment in the industry. It is thus imperative that universities develop linkages with the industry to receive their feedback on the quality of graduates and to keep abreast of the employment opportunities available.

To facilitate interface with the industry, there should first be a structural interface between the university and the industry. Such a structure should specify the roles that industry bodies should play to align the higher education system to the employment opportunities available.

The working group on 12 FYP mentions that the quality of employment in organized sector is generally high though the scope of additional employment generation in this sector is rather limited. Significant employment generation is taking place in tertiary sector, particularly, in service industries. Self-employment and small business continue to play a vital role in this regard.

It is critical to recognize that developing and inspiring individuals with an interest in starting ventures has the potential to create significant impacts on markets, economies and communities. It is well known that innovation is a key driver of growth based on knowledge inputs. Innovation is also emerging as one of the key factors in India's economic growth.

In this context, the state should promote self-employment opportunities in addition to strengthening the placement of students to improve the employment scenario and prevent brain-drain. The state should take steps towards strengthening the forward and backward linkages to finance, marketing and human resource management, to assist those who are or seek to be self-employed. Qualified entrepreneurs with such support will be capable of implementing new technologies and using innovative methods to establish more efficient enterprises and institutions.

Even though the country is known to have the largest technical education system in the world with undergraduate intake capacity exceeding over 8 lakhs per year, India produces barely 1000 engineering and applied science PhDs per year. Even in terms of contributions to scientific research publications, India contributes a paltry 3% as opposed to China at 12% . Hence, Punjab needs to take proactive steps for promotion of research activities as a lead state in the country.

The innovative industry-interface structures can also be explored that provide incentives for companies to participate for e.g. district level 'Innovation Labs' can be set-up to bring Industry and Institute together, 'Technology Project Competitions' can be organized for students and faculty (like Business Plan / Case Study Competition) with active industry-institute collaboration. The box items below give example of some successful interfaces between industry and academia.

Another form of interaction is in a one-time event conducted to give students exposure to issues faced by the industry.

7.2 Environment to foster innovation and entrepreneurship through Entrepreneurship Awareness and Development Programs

Punjab needs a multi-pronged approach to create infrastructure and an environment to harness the potential and creativity of young entrepreneurs emerging from the technical education and industrial training system. This includes providing funding and necessary support to Universities for setting up incubation centers to foster research spirit, creativity and innovation and entrepreneurial and leadership qualities in the students. Polytechnics can be linked to Incubation centers at Engineering Colleges and Management Schools so that synergies of both engineering and management expertise can be utilized for promoting innovations. The following initiatives/ programs can be undertaken in this context.

1) A comprehensive Entrepreneurship Awareness and Development Program (EAP/EDP) should be designed to create awareness about entrepreneurship, supporting innovation, commercialization of the business idea and business incubation.
2) The objective of the Entrepreneurship Development Programs (EDP) should be to promote entrepreneurship based on indigenous knowledge by providing necessary guidance in go-to market strategies, commercializing product ideas, managing innovations, access to market, finance and skills, support services and intellectual property protection. The objective of the Entrepreneurship Awareness Programs (EAP) should be to foster the spirit of entrepreneurship among rural youths as well create more job opportunities and new products and services.
   As part of these programs, following activities can be taken up
   a) Training focused on both on the technical and managerial aspects of entrepreneurship including information related to loans (credit), process of creating start-ups, patenting, entrepreneurial and networking skills, etc. can be provided.
   b) Seminars and workshops where prominent entrepreneurs from the state share their experience can be organized, at the state level. This will also serve as a platform for the budding entrepreneurs from different regions to interact and forge potential alliance and partnerships. In these forums successful

entrepreneurs from the state should be recognized through awards and citations.

c) The courses and curriculum of these programs should be mapped to competency framework/ model discussed under Quality

d) An entrepreneurship portal can be set up with a platform for information documentation, interaction and collaboration among entrepreneurs.

e) The state should create awareness regarding this program through the media, publicizing success stories.

f) Mentorship programs can be designed where the principals/ faculty of the concerned institutes is involved.

g) Sector Skill Councils from each sector can work closely with the entrepreneurs to transform innovations into application on the field.

h) An Intellectual Property Rights (IPR) support cell can be created to assist innovators/entrepreneurs with the technical and legal aspects of IPR creation.

3) In conjunction to the EDP and EAP, Punjab can also initiate a program to set up Technology Entrepreneurs Parks (TEP) in each district which will cater to graduates/ students from the technical education. Once TEP is set up, it can act as nodal agency to offer training and consultancy services for various Governments, public and private sectors. It can also be involved in giving need-based training to researchers, entrepreneurs and industries by using resources in terms of manpower and infrastructure of the university and various national and state institutions. This TEP would also focus on commercializing resources, managing innovations and Intellectual Property, commercialization of technologies, promotion of Industry sponsored research and contract research and to build synergy between industries and academia.

4) The State can invite private investors/players and tap their considerable technological, organizational, and marketing capabilities to set up these TEPs. These centers can assist interested start-ups by creating go-to-market strategies, providing necessary guidance, and commercialization of an idea or a product. The main objectives of this program should be

a) Create shared facilities and infrastructure for the use of entrepreneurs, researchers and industries in the state. Sector specific TEPs according to the industrial presence in the districts will improve viability of the program.

b) Coordinate with all stakeholders in the innovation and entrepreneurship ecosystem including all streams of education - polytechnics, engineering and management colleges, to harness synergies of both engineering and management expertise.

c) Arrange entrepreneurial training especially in SSI and MSI sectors like food processing, leather products, textiles, restaurants and hotels, tourism and information technology.

5) The state should encourage universities or prominent/top-rated institutions in Punjab (Polytechnics/Degree Institutions) with adequate infrastructure and facility to create entrepreneurship clubs and incubation centers. This can also lead to an increase in industry academia synergies. These kinds of incubation centers will create and develop a critical awareness of the broad environmental influences (legal, ethical, social, cultural, economic, technological, and international) which create the context within which innovation and entrepreneurship take place. In addition, it will

provide a platform for the students to learn key concepts that underpin innovation and entrepreneurship.

6) In addition, entrepreneurship can be introduced in the current syllabi in diploma and graduate programs. This would require revision of curriculum to incorporate module on entrepreneurship: It is important to emphasize on entrepreneurship both at the diploma and degree level. PTU/PSTEB can revise curriculum to incorporate a compulsory module on entrepreneurship for all students so that they are equipped to implement new ideas as well as create and manage new ventures.

7) The state should also provide financial assistance to students who participate in the abovementioned programs and initiatives.

   a) Support needs to be provided, in terms of access to capital for self-employment loans, to the passed-out trainees to enable them to set-up to their own small scale industry / servicing units. The principals of colleges/ polytechnics may be consulted for recommendation of loans for "self-employment". Such an initiative can be planned in consultation with the District Industries Centre and the district level industry bodies.

   b) The candidates can also be provided access to equipment and facilities at the institutes at a nominal rent. In addition, they may be allowed to conduct training as guest faculty at these institutes.

   c) The state should contribute through funding and necessary support for setting up TEPs. The State can invite private investors/players and tap their considerable technological, organizational, and marketing capabilities to set up TEPs. The State can also seek funding from the National Scheme on 'Support of entrepreneurial and managerial development of small medium enterprises (SME) through incubators' and from National Science and Technology Entrepreneurship Development Board (NSTEDB)

   d) Entrepreneurship Development should also be encouraged through access to funding through avenues like KVIC and Venture Capital Fund.

7.3 Formation of a research forum and state-of-the-art facility for research and knowledge resources

The state should create a research forum that fosters dialogue on themes related to technical/management education, society and policy for cross-disciplinary interaction and communication between the policy makers, Government functionaries, industry, the media and scientists. This would be an open forum where leading scientists, researchers, entrepreneurs and innovators, policy planners, students and general public from across the State as well as the country may discuss and debate the direction that research is taking in technical education. The breakthrough in various areas may be presented through various formats including lectures, workshops etc. Punjab can create a platform or an event that ensures dialogue between universities and students and promotes knowledge exchange.

A similar successful case study that was implemented in the early 1980s in UK is the Warwick Manufacturing Group. This example is a case in point of an academic department at a University that improves competitiveness through the application of innovation, new technologies and skills deployment, thereby bringing in academic rigor to industrial and organizational practice.

The research forum would comprise four complementary programs/tracks aimed at various dimensions related to research work and career for researchers and research-industry linkage and research-citizen link.

1) Research track: This track will be the focal point of the forum where renowned researchers will host talks, seminars, webinars, workshops, debates, discussions on various emerging topics of research currently underway in the State and country. Specifically, this track will be used to discuss the issues related to scientific communication and the relationship between research and community. This will be handled by the Program Committee in coordination with Centre of Excellence in Emerging Technologies.

2) Career for researchers track: This track will be specifically addressed to PhDs, young researchers and students who will be given the opportunity to discuss the future of research with respect to policies, flexibility, scientific publications and communication. It can also highlight the other skills required for the scientific career including inter-personal communication, writing skills as well as preparedness for job interviews. This track will provide informal forums for young researchers and students to interact with prominent researchers to talk about science and scientific careers in a pleasant and informal environment. At the same time, students and researchers will get an opportunity to interact with professionals from the industry and develop an understanding of the employment opportunities currently available for specific areas of study. At the same time, these interactions will enable industry to identify potential employees and target institutions that are doing relevant research in specific areas. The state can also consider inducting/ recruiting a minimum critical number of, say 100, world class researchers to improve the quality of research initially.

3) Research-industry linkage: This track will be specifically addressed to businesses and entrepreneurs with focus on applied research and opportunities for development of new highly innovative businesses. At the same time, it will provide a forum for non-profit organizations, universities and incubators to present innovative activities and prototypes.

4) Research-citizen link: This track will link researchers with broader community where their research outputs will be used. Under this track/program, collaborative projects may be undertaken by researchers and community members and schools in the state, where the community will actively participate in the collection of scientific data. Participants involved can contribute to scientific research by collecting data following scientific protocols that will be reflected in the real outcomes of scientific research. Participants, especially students and young researchers can also discover potential pathways for careers in science. The forum can award and recognize the participation of participants at the program. This will also improve the awareness of science education in schools which can lead to better quality of inputs for technical education.

Punjab can initiate a program to set up Research Laboratory and Knowledge Resource center with the following functions

1) Sector-focused laboratory and research centers to encourage other institutions/students from other institutions to take up research in their area of interest.
2) This center can serve as a regional hub for research and learning and host arrangements such as 'Warwick Manufacturing Group' (explained earlier in box item).
3) This Centre can also provide policy support to Government in the area of science, technology and innovation (STI) systems
4) This Centre can improve linkages in the industrial sector between SMEs, large firms, science and technology institutions, and business associations

This Centre in collaboration with the Department of Technical Education can also develop a 'Citation Index' to track all publications of all Universities in the State. Universities should give monetary incentives to faculty and researchers for publications and incentives should not be merely based on quantity of publications, but it should depend on the quality of journals published in.

To inculcate a research culture, collaboration with foreign universities/institutions can be explored. Both government to government and institute to institute interactions can be considered for this purpose.

The Department of Technical Education/PTU should provide funds to institutes based on their performance which can be used to incentivize young faculty members and students to take up research in the area of interest. In addition, the Department can organize to have 'Priority Research Fund' for investments in projects of state importance. The Department should constitute a Research Council in the state to select and disburse funds for these projects. The disbursement of research funds can be based on the performance of institutes where the better performing institutes can avail of more research funds than others.

7.4 Institutional Mechanisms

Punjab should also set up a State Entrepreneurship and Placement Cell (SEPC) which can design and implement the TEP program. The SEPC can also be responsible for developing the entrepreneurship awareness and development programs including mentorship programs, financial assistance schemes, coordination with sector skill councils, workshops, etc. This agency can also be made responsible for carrying out certain placement related activities like identifying opportunities with private and public enterprises, conducting job fairs, etc. for institutes that do not possess adequate capacity. This body can have members from government agencies like DoTE, Punjab InfoTech, PIDB, etc. New models of centralizing and outsourcing the placement function at institutes may be considered, for e.g. the students during admission may be recruited for a company based on the aptitude tests and interviews so that the funding of the education can be partially shared by the company. The placement cell at each institute and the head-quarters should be responsible for coordinating the Entrepreneurship Development Programs at the institute level.

In order to create a research forum, Punjab should also set up a Program Committee with a multi-disciplinary team of eminent researchers from IISER, ISB, INST, etc. and leading

entreprenurs as well as representatives from premier educational institutions in the state. This Committee can be chaired by the Principal Secretary, Department of Technical, Government of Punjab. In addition, the Committee might have representations from other related Departments such as Department of Industries and Commerce, Punjab Information Technology and Communication (PICTC Ltd.), Department of Higher Education, etc. In order to achieve success, an event management agency can be engaged with the responsibility to engage and execute the entire event.

Punjab can set up Research Laboratory and Knowledge Resource center either at the upcoming Multi-Disciplinary Academies or State Institute of Technical Teachers Training and Research Centre with grants from the State Government.

7.4.1 Key Activities and Timelines

Activity	Timeline
Setting up of the TE 'Policy Planning, Implementation and Monitoring Cell (PPIMC)'	Short Term
Set up a State Entrepreneurship and Placement Cell (SEPC) to design and implement the Technology Entrepreneurs Parks (TEP) program	Short Term
Creation of entrepreneurship portal and other awareness programs	Short Term
Set up a Program Committee for creating a research forum	Short Term
Organize research funds for colleges	Short Term
Initiate a program to set up TEPs in each district	Medium Term
Design and implementation of entrepreneurship awareness and development programs(EDP and EAP) and mentorship programs	Medium Term
Implementation of financial assistance schemes	Medium Term
Set up Research Laboratory and Knowledge Resource Centre	Medium Term

7.4.2 Indicative Budget

Activity	Indicative Budget (in lakhs)
Setting up a State Entrepreneurship and Placement Cell (SEPC)	50
Design and implementation of the Technology Entrepreneurs Parks (TEP) program	30
Implementation of program to set up TEPs in each district (for 7 Districts in phase 1)	700
Setting up a Program Committee for creating a research forum	15
Research funds for colleges (10 colleges)	500
Design and implementation of entrepreneurship awareness and development programs (EDP and EAP) and mentorship programs (2 programs)	100
Setting up Research Laboratory and Knowledge Resource Centre	500
TOTAL	1895

7.4.3 Monitoring Indicators

Outputs	*Outcomes*

Number of TEPs created	Number of graduates opting for self-employment
Number of EDPs and EAPs conducted	Number of jobs created through TEP program
Number of students covered in EDPs and EAPs	Number of publications in journals from Punjab
Number of research tracks created	
Number of research forum created	
Percentage of funds allotted for research	

Chapter 8

Management and Governance

8.1   Key Actions:

1) *Create a **comprehensive monitoring and evaluation framework** for technical education in Punjab*
2) *Revise **personnel policy** to ensure accountability and outcomes*
3) *Implement reforms in **institute funding** based on the performance of the institute*
4) *Design and develop a **Technical Education (TE-MIS) Management Information System** for effective and informed decision making*
5) *Carry out **impact evaluation studies** and publish the findings*
6) *Form **Technical Education Gateway of Punjab** to connect all technical institutes in the state through technology platform*
7) *Devise strategy for **innovative financing mechanisms including a PPP blueprint** for training and **create a PPP cell within the Department** for this purpose*
8) *Conduct seminars and workshops to promote private/ global investment in technical education*
9) *Introduce **functional, administrational, financial autonomy of institutions** in a phased manner*
10) *Enable **internal revenue generation** at institutes*

Data should be collected periodically and analyzed in order to assess the impact of education and training on employability. Empirical evidence on wage premium or other advantages enjoyed by graduates, seat utilization in institutes, nature of employment post-training, efficacy of various schemes, etc. is essential for continuous improvement. A detailed exercise of manpower analysis is a necessary step to understand the nature and quantum of demand and the mismatch between the skill outcome and the requirements of the labour market.

In addition to undertaking interventions aimed at enhancing the state along the dimensions of technical education, it is necessary to monitor the progress of Punjab along the various dimensions. This will enable a periodic evaluation of whether the state is progressing in the appropriate manner towards its objectives and vision.

8.2   Detailed Interventions:

8.2.1   Monitoring & Evaluation Framework

For an effective and responsive technical education system, a clear and comprehensive monitoring and evaluation framework needs to be articulated which covers the following aspects

1) Standardized parameters for performance of the institutes covering infrastructure, faculty, and student services like admission, training and placement should be clearly defined. Thereafter a comprehensive rating system can be introduced. This will help move away from regulation to performance based management of institutions. PTU has already initiated the system of ranking its institutions based on certain

parameters such as infrastructure, placements of students, availability of faculty staff, etc. However, only institutional ranking system has been put into place. Rankings on various parameters such as quality of faculty, industry-linked academic institutions, and accredited institutions should be publicly displayed on the PTU's web portal to encourage transparency and students to make the right choices. The rating information for each branch for each institute can be made available to the prospective students to help selection of institutes during the admission process. It is also highly recommended that a similar ranking mechanism be introduced for diploma-level institutions wherein the rankings are made available on the web portal of either the 'Department or Board'.

2) Colleges should be encouraged to share their Annual Plan/Report and Long term Strategy (5 Year Plan) in their respective websites.

3) Currently, there is no funding received from the Government for engineering colleges. Hence, it is recommended that ratings of institutes be made public so that based on the performance of the institute, the institutes can request for grants or funding from the Government for its initiatives. Hence, in the medium term once the rating system is stabilized the funding received by the institute should be linked to its performance of the institute.

4) In addition periodic (once in 2-3 years) impact evaluation studies needs to be undertaken to aid policy making and ascertain the effectiveness of implementation of the schemes/ interventions. The M&E framework should include the outcomes expected from each scheme or intervention.

5) The M&E framework should be the basis for designing the management information system (discussed below) so that the data collection can be streamlined reducing duplication of effort.

8.2.2 Ensure accreditation and high ratings of all institutes of higher education

There is a serious dearth of information on the quality of institutions of technical education. As a result, students have to make the choice of colleges based on limited information such as available placement statistics, non-rigorous media ratings and unreliable information in advertisements.

An accredited college will also receive a rating of performance. The ratings of colleges should be made known to the people. Performance incentives should be given to institutions with a high accredited rating.

1) Technical education department/ PTU should mandate accreditation of all government and private aided institutions and that the accredited rating of the college is prominently displayed in the college office/ website.

2) All colleges, including private unaided colleges, with a high rating should receive a college grant for discretionary expenditure.

3) Technical education department should change the existing system of setting a single ceiling for fees that can be charged by private colleges for non-government seats. The new system should have three ceilings for fees that can be charged depending on whether the college gets a high, medium or low rating. All private institutions that are not accredited should be permitted to charge fees only up to the lowest fee ceiling.

4) Colleges that have been rated 'high' can be considered for grant of autonomy status.

8.2.3 Technical Education Management Information System (TE MIS)

To improve the availability of information about the availability and effectiveness of various branches under each of the courses, information collected needs to be consolidated in standard forms and made available to relevant stakeholders- DoTE, other departments (industry and commerce, school education), industry bodies and students, etc. in digital format in a single platform (department website) to improve decision making by each stakeholder. This information needs to be updated regularly with the information collected through inspections and other reporting mechanisms. While the entire data may be housed in a Management Information System (TEMIS) stakeholder specific views should be available in the website. The information related to the capacity, admissions, infrastructure, scholarships, fees, industry collaborations (MoUs), placements, faculty, learning achievements, alumni details should be collected.

The introduction e-Governance (e.g. ERP- Enterprise Resource Planning Package) for technical education through TE MIS can facilitate in improving transparency, providing speedy information, dissemination, improving administrative efficiency. Implementing such a system will also help us to monitor academic standards by enabling continuous monitoring, assessment and meaningful evaluation of the instructor and the student.

The TE MIS should also include student and administrative support systems to cover processes such as registration and fee collection, examination and student records. By disseminating specific information to the parents (e.g. attendance and evaluation information) it can also enhance the parents' involvement. Over a period of time the system can obtain feedback from students to modify course curriculum if deemed appropriate by the authorities which can increase the number of employable students. Once this system has been operationalized, district-level report cards can be generated which can improve planning, and decision-making, forecasting, etc. The reports generated on the web-based system and performance of institutions can be tracked through this.

The NKC recommends creation of an electronic database of certified training providers as well as electronic identification for certified workers to ensure recognition of certification by employers, both in India and abroad,. The TE MIS can act as a repository of such a database at the state level and can be synchronized to the national academic depository in the future as envisaged by the proposed legislation of National Academic Depository (NAD) Bill.

On the lines of the 'National Knowledge Network' recommended by National Knowledge Commission, Punjab can form a Technical Education Gateway which allows all the institutes' to connect by extending computer infrastructure. The Eleventh Five Year Plan has also emphasized on the National Mission on Education through IT. The Technical Education Gateway can provide the following:

1) Generate useful learning content and provide connectivity to institutes and learners
2) Offer training for teachers to make the best use of the e-contents
3) Improve the standards of education in government colleges as well as private colleges

8.2.4 Blueprint for PPP in technical education

The strategies described so far are directed towards achievement of the earlier defined policy objectives for technical education. These objectives are attainable only when there are adequate facilitating outputs such as colleges, teachers and infrastructure. Infrastructure is a critical success factor in realizing the objectives of technical education. It is expected that the bulk of investments in infrastructure will be made by the private sector, with the government playing the role of an enabler and facilitator. However, essential infrastructure where the private sector shows little interest should be developed by the government.

Seminars and workshops to promote private/ global investment in technical education and exploration of various models of partnerships could be considered to engage with the private sector for creating such a framework.

A blueprint for private sector involvement is required to spell out the precise nature of the involvement of private sector articulating how, when, where, and why private partners can become involved in developing, underwriting, and managing such projects including financial strategies for launching and sustaining education and training projects.

The introduction of PPPs raises issues of governance and accountability and the government should ensure that PPPs deliver the desired end result, i.e., improved quality of services to the people at reasonable prices. Accordingly the concession agreements and other contracts governing performance under these PPPs should be linked to the outcomes envisaged as part of the processin terms of SLAs (Service Level Agreements) and KPIs (Key Performance Indicators). To enforcestrict monitoring compliance to these agreements requires enhancing the project management capabilities of the government agencies commissioning these projects. In addition to specifying clearly the expected the quality of services, mechanisms to enforce obligations and also punish violations are necessary.

Another aspect is the selection process for these projects which should be competitive and transparent in line with the public procurement laws and regulations. Where competition is not feasible, the method of choosing the partner must be highly transparent. The process of selection should be regularly audited to check compliance with the notified procedures.

The various aspects where PPP may be explored range from infrastructure to design and delivery of courses by the private partner including

1) Creation of infrastructure required for practical labs/ delivery of the courses/ training programs including classrooms, sports facilities, equipment, IT infrastructure, etc. with repair& maintenance of the same.,
2) Design and development of courses including lesson plans, course content, presentations, assignments, test papers, answer sheets & other teaching material.
3) Advertisement, orientation, awareness creation, printing of admission forms, brochures, pamphlets, posters, answer sheets, other publicity material, and consumables for training course
4) Human resource management
5) Organizing job festivals/ job melas / campus interviews for trainees.

The blueprint should also set the framework for PPP in skill development in Punjab including

1) Institutional funding could be limited to an upfront capital grant and extended to well performing private institutes to encourage trades that are in demand but not offered in private institutes due to the high initial investment. Recurring funding requirement could be linked to the performance of the institute. Land incentive norms based on the intake capacity and ultimate student strength of the institutions should also be specified.
2) Special incentives for setting up institutes in extremely backward/ border areas of the state where there may be initial difficulty in attracting students as well as faculty or institutes for disadvantaged groups like women, SC/ST trainees, etc.
3) In addition, one of the financial incentives that can be extended to private players is the tax subsidies/ breaks to start institutes, especially in identified sectors.
4) Norms on admission process/fee structure/ seat sharing in case of such institutes should be specified including transaction models for provision of services.
5) Norms on participation of foreign players including NRIs, having experience in the field of skill development
6) Representation of state government management of the institute to ensure its proper functioning including norms on ownership of the property wherein the government should own assets in the proportion of support provided by it.
7) Case by case treatment for potential conflict of interest e.g. between training and certifying agencies, delivery and quality control agencies, etc.
8) Applicable performance guarantee/bond with respect to achievement of the pre-agreed targets in terms of outcomes and deliverables.
9) Eligibility norms may include empanelment with Government of India agencies e.g. Private Training Providers (PTPs) empanelled with various ministries, etc.
10) While service levels for private sector are common, such service levels should also be defined for services provided by various government agencies as part of the PPP blue print.

8.3 Institutional Mechanisms

A PPP cell can be created in the Department to facilitate private partners by setting up a single window clearance system for all aspects related to PPP in the training and skill development system. This cell shall decide on any application under PPP within a specified time-limit from the date of receipt of the application.

This cell can also be responsible for implementing interventions related to the phased handover of management of training institutes to private organizations and promotion of internal revenue generation for institutes. In other cases the institutional mechanisms are included in the interventions mentioned above.

8.3.1 Key Activities and Timelines

Activity	Timeline
Creation of a comprehensive Monitoring and Evaluation framework	Short Term
Design and development of a TE MIS	Short Term
Formation of a Technical Education Gateway of Punjab	Short Term

Creation of blueprint for PPP in skill development	Short Term
Set up of a PPP cell in the Department	Short Term
Revision of personnel policy	Medium Term
Promotion of Internal Revenue Generation for institutes	Medium Term
Carry out impact evaluation studies and publish the findings	Medium Term
Conduct Way forward' Seminars and workshops to promote private/ global investment in technical education	Short Term

8.3.2 Indicative Budget

Activity	Budget (in lakhs)
Design and implementation of Comprehensive Monitoring and Evaluation framework	50
Design and development of a TE MIS	500
Set up of a PPP cell in the Department	20
Impact evaluation studies and publish the findings (5 studies across schemes)	250
Way forward' Seminars and workshops to promote private/ global investment in technical education (3 seminars)	30
TOTAL	850

8.3.3 Monitoring Indicators

Outputs	*Outcomes*
Number of evaluation studies conducted	Quality of data collected through MIS
Number of Universities linked through the gateway.	Report cards generated through MIS