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Drastic Change in Technical Education in India	**Author:** **ARUN CHANDRA SAWHNEY** **FIE**

Introduction

As per the present economic industrial scenario and based on experience of last 50 years, it is found that there is acute shortage of engineers in core disciplines. Even if fresh engineers from core branches are available they require extensive training for 2-3 years to take up assignment in the field of technology (know how), process engineering, design & engineering, operation, maintenance, manufacturing, production, procurement, logistics, technical marketing, construction, erection testing and commissioning, Techno Economics , Finance and Costing.

There is huge gap between the need and demand placed by the fast-technological changes and the emerging global market trends that are making the growth of core industries brings out the demand for complementing and supplementing the formal education through the non formal education and training

The profiles of the career opportunities keep dynamically changing as newer and newer technologies emerge and the global market requirements change.

The formal education focuses on the too much theory and fundamental concepts in different subjects and does neither inculcate any kind of entrepreneurship skills to prepare them to set up their own industries nor prepare them with practical skills to make them directly employable in any manufacturing, construction or service industry. This calls for urgent need for bringing drastic changes in technical education to bridge the gap that existing between the needs of the industry and the academic curricula.

With the increase in population, increase in urbanization and service industry, the basic needs of the masses like Food, Clothing, Housing, Telecommunication Information highway, Transport, Education, Health & Hospitality Sectors, Insurance, Entertainments, Tourism & Event Management, Digital Marketing & Payment, Pharmacy, House Hold appliances, the demand for products related to above (For example Food grains, Pulses, Vegetable Oils, Fruits & Vegetables, Houses, House hold

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appliances like Smart TVs, Air Conditioners, Refrigerators, Ovens, Lighting Equipment, Water Supply & Sanitation wares, Furnitures, Smart Mobile Phones, Tablets, Smart Televisions , Two & Four wheelers, Petroleum Products, Chemicals & Fertilizers, Hospitals, Schools, Banking , Entertainment games, movies,) are bound to increase and it shall be the duty of the Central/State Government Agencies to estimate the short term, medium term and long term demands in each sector. Based on the demand estimated by these agencies and available capacity, the short fall shall be estimated for each sector. These short falls shall be translated into skills demand and a holistic planning model shall be prepared for every field right from Agriculture to space industry. Accordingly, whole education system shall be planned to fill the gap by skills development and engaging students in production activities after finishing their education. Technical Colleges shall become the hub for turning engineers into entrepreneurs and also for supply of any kind of technical skills manpower to the industry and service industries.

The salient features of new education system will be:

For BE Students

1. There will be two streams of education and training. One for entrepreneurship and the other for employment.
2. Those who chose entrepreneur ship will choose any four industries out of listed industries pertaining to various disciplines.
3. Each student will be trained for setting up of these four industries for full four years.
4. Each student will start any one of the four industries after graduation.
5. He will help and guide to start other three industries to his family members, friends and other members of the community in which he lives and will be their mentor and guide.

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6. The other group who opt for employment will be trained for joining the industry as operating engineers in those industries started by fellow students as above or as per the planned and demand requirements of the manufacturing, construction and service industries received by Colleges in advance so that immediately after four years of study/training they straight way join the industry as working engineer without any further training.

For Diploma Holders

1. There will be two streams of training. One for entrepreneurship and the other for employment.
2. Those who chose entrepreneur ship will choose any Two industries out of listed industries pertaining to various disciplines.
3. Each student will be trained for setting up of these two industries for full three years.
4. Each student will start any one of the two industries after graduation.
5. He will help and guide to start other industry to his family members, friend and other member of the community in which he lives and will be his mentor and guide.
6. Those who chose employment as their career will be trained as supervisors, operators, foreman, inspectors or such fields needed for those industries started by Graduate Engineers and Diploma holders as per the needs/requirements sent to them from engineering colleges and Polytechnics and existing industries as per planned forecasting.
7. The other group who opt for employment will be trained for joining the industry as operating engineers in those industries started by fellow students as above or as per the demand of the Industry received by Colleges in advance so that immediately after three years of study/training he straight way join the industry as working supervisors, operators, foreman, inspectors or such fields needed by those industries without any further training.

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For ITI Students

1. There will be two streams of training. One for entrepreneurship and the other for employment.
2. Those who chose entrepreneur ship will choose one industry (Small scale industries, Kutir Udyog or small scale venture based on forest produce, food processing, masala udyog, mason, cycle & two wheeler mechanic, plumber, tyre tube repairing, house hold appliances' repairing, metal art work, tailoring, knitting, tile work, painting, polishing work, growing mushrooms, vegetables, fruits, herbs and similar items not requiring higher skills).
3. Such student will be trained for setting up of above such industry.
4. Those who chose employment as their career will be trained as masons, fitters, mechanic, skilled workers, electrician, machinist, data entry operators, CAD operators, or such fields needed for those industries started by Graduate Engineers and Diploma holders as per the needs/requirements sent to them from engineering colleges and Polytechnics and existing industries as per planned forecasting so that immediately after one year of training he straight way join the industry as needed by those industries without any further training.

Common to All

1. There will be a technical university under which all the three streams BE, Diploma and ITI will be functioning.
2. There will be **two distinct departments**. One will be for training entrepreneurs the other will be technical employment. Both working in unison.
3. The department will work in close coordination with Neeti Aayog and various chambers/federations of Commerce and Industries, Central & State Industries Departments, Technical Consultancy Organizations, WTO, Import/Export Cell and all other such departments/companies who will supply them List of Industries to be setup in near future (Next Five years) for which demand outstrips supply or import outstrips

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exports. Based on this, departments will freeze/short list items for manufacturing or skill sets require for service industries which will be taken up for start up by their students. This list can be further classified based on investment required under three categories (May be more). First category may be those industries (manufacturing or service requiring investment of Rs 50 lakh or less) and run by Single student entrepreneur trained by them. The other group may be run by two students with investment limits of Rs 1 Crore and similarly other group of 3 or more students with an investment of more than one crore.

4. There will be a lead bank or more than one bank in the University who will be responsible for disbursing the loans to those students at the end of their study who opt for entrepreneurship and choose to start any one of the chosen industries trained by the college/university
5. The guarantor of the student for recovery of the loan will be the Technical University as University is solely responsible for imparting such education and training that will train such students to venture for entrepreneurship.
6. The loan returned will be kept in separate account maintained by the University. This will become future corpus for distribution of loans to student entrepreneurs. This will receive donations from industries, old student entrepreneurs and aid from World Bank, Asian bank, Bricks, Mudra Bank and ultimately become self fund generating body.

The main objectives of the entrepreneurship department will be as follows:

1. To develop entrepreneur skills in the students so that they can to start their own industry (Manufacturing or Service) in their chosen field of specialization immediately after graduation.
1. To train Student Entrepreneur in all the gamut of the chosen industries (Four for BE, two for Diploma and one for ITI) to enable him to start the industry at the end of his course.

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2. The whole education will be based on imparting such multi disciplinary subjects as may be required to help him starting the new venture (Manufacturing or service industry)
3. **Normally disciplines /subjects required to start an industry are given in Annexure-1,** This is only indicative and not exhaustive and will depend upon the industry chosen for start up. Once the above engineering and managerial concepts are taught there is nothing additionally is required to run an industry. There is no reason for any failure. (except red tapism-but this can be taken care by university being guarantor, mentor and guide and any problems faced by student entrepreneur can be promptly taken up by university with respective Government/Chancellor)

The main objective of the **Employment Generating department will be as follows**:

- To enhance and guarantee the employability of technical students.
- To enhance the standard of technical education and training so that he becomes immediately employable in the industries being started by student entrepreneur or full fill the demand of the respective specific industry already communicated to the department by the industries at the beginning of the first year session as per skill gap supply demand requirements given by industries (Manufacturing or service)
- To reinforce the student skills and acquire industry–specific knowledge from trained faculty and experts from industries.
- To identify and inform the concerned industries about the selected candidate for their requirements as per skill demand supply gap furnished by them.
- To prepare and finalize the broad syllabus for study and training in consultation with concerned industry. To provide both technical and soft skills to the students as required.
- Performance appraisal of the student after each semester will be done jointly by College and the concerned industry to ensure that the

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training is undergoing in line with the needs of the industry. If required mid course changes may be carried out.

- Such students are required to go for internship after each semester in the concerned industry who will give them a feel what is expected from them after completion of their course.
- After the completion of the course concerned industry will give them employment on the terms and conditions pre-finalized in consultation with Industry as per Govt formulated norms.
- In case any further special training is required the same can be given after employment by the concerned industry. (However, in most of the cases it may not be required)
- To bridge the gap between industry and technical institutions fully.
- This will be the only platform for accessing the skills required to get into industry.
- To meet the needs of unemployed and non-employable engineering graduates and to improve their communication as well as technical skills.
- To offer suitable candidates to different industries.
- To help young graduates to find jobs through appropriate training.
- To run finishing school to impart above training for those engineers/technicians who have finished their education earlier and need such skills to make them employable or who want to start their own industry.

Financing

i. By Banks situated in the university
ii. Loan to be disbursed by the University bank.
iii. University to be Guaranteer.
iv. Loan will be return to university by student entrepreneurs.
v. Loan refunds, grant from Government, Asian Dev Fund/World bank/BRICKS, Donations from old student Entrepreneurs, Industries/Individuals/Foundations all will contribute to corpus fund.

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vi. After sometime this will become Corpus fund of bank of the university.

Training of Faculty members

i. Existing to be retained for theory and its application to real life situation
ii. New faculty from Industry
iii. Services of Retired Professionals/businessman/professors/Technicians/engineers to be utilized for finishing school

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Annexure-I

Basic Entrepreneurship/Engineering Skill (Common to All)

1. **Site Location & Layout Considerations**

A. **Site:** Location for Minimization of Total " t.km" route length and cost, rail road, power, water, gas, soil condition,

Layout: Rational flow of materials, Provision for future expansion, Shortest possible communication network, entry gates., existing terrain, Roads & drainage system, Road & Rail linkage Seismic design, Environmental factors, Water Reservoir, Rain Harvesting, Switch Yard, Segregation, Minimum Over head & Ground Clearances

2. **Technological Considerations**

Process Selection, Basic Engineering

3 **Design Considerations**

Desired Production, Quantity/Quality, Modular Design , Standard Spacing of columns, building sizes Productivity of machines, Inbuilt capacity for future expansion, Safety Factors/Dynamic Loading Factors/Slope Factors/Filling Factors/Free Board, Availability of machines per year, Life span of plant/machines, Materials Characteristics, Specific Consumptions of utilities, Checking for Strength, Stability & Deflection, Requirements of all utilities, auxiliary facilities, power, water, air, gases, hoisting & handling, mounted electrics, instruments., Provision of Ramps, Lifts, Platforms, stairs, doors, corridors, restrooms of desired slopes, widths & dimensions considering normal persons, disability and old age.

A **holistic design is a solution that is greater than sum of its parts.**

4. **Operation Considerations**

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Ease of operation, Flexibility in operation. Degree of automation desired, Degree of protection desired, duty cycles, all weather operation, quick changeover of parts, Comfortable environment, Lower pollution –Air, Water & Noise, Operators manuals

5. Maintenance Considerations

Should require lesser maintenance, Minimum Down time, Fit & forget concept, easily approachable-all parts needing maintenance to have proper hoisting and handling with adequate headroom, Easy lowering & lifting into Truck/Trailer, Corrosion & Abrasion prevention, Repair Workshop, Maintenance Manuals etc.

6. STANDARDISATION/INTERCHANGABILITY

BIS Codes & Standards. Must comply to some reputed standards – Firstly it shall comply with Indian Standards. If the same is not available, the it may comply with any International standards acceptable., IRC Codes & Standards, National Building code Of India, Piping, Pressure Vessels codes, TAC Rules for firefighting facilities.

7. Safety Requirements

All the buildings, plant & equipment shall comply with all the safety requirements for the Safe & accident free operation.

8. STATUTORY REQUIREMENTS

All plants, Buildings, equipment must comply with the law of the place where it is being erected/constructed/installed. Each State may have different provisions pertaining to same requirements.

9. Erection Considerations

Erection Sequence, Erection Methodology, Special Requirements/OD consignment, building roof erection, Minimizing Erection Time. In situ, Temp Protection Batching Plants-Capacity & Number, alignment, lining,

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levelling & grouting, Inserts Placements, Water requirement, Temporary Power requirement, Manpower requirements, Interfacing with other units, Welding requirements, Space requirements-Fabrication, storage and temp assembly.

10. Project Management

Financial tie-up, Finalization of modus-operandi for project, Clearance from statutory authorities, Land acquisition
Estimation of duration of construction period of the project, implementation schedule, resources requirements, Quality Control**,** **Procurement** Services, Selection of Vendors, Cost and Time Control, Project Monitoring, Specialist Supervision, Enabling Works, Construction Planning
Measurement and Certification, Safety & Security Management, Store & inventory management
Site survey and soil investigation
Completion of basic engineering, detailed Engineering, Tendering & Procurement, Civil & Structural work, Erection of Equipment, Commissioning

11 Ergonomics

Ergonomics is the science of making things simple, comfortable and efficient. If a plant or machine is simple to operate, it will be more acceptable. Comfort in the human-machine interface and the mental aspects of the product or service.

11. Transportation Logistics

Ship/Rail/Road/Air/ Conveyor, Pipeline, Water way transport, OD Size of consignment, Packaging, Container or Loose, Special Requirements-Special Bogie, Trailer,

12. Normal Spares Two Years, Commissioning & Insurance Spares

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13. Financial Management: Capital Cost, Operating Cost, Profit & Loss, Financial Indices, IRR, DSCR, Pay Back Period.

14 Contracts Management

Legal aspects of contracts: definition of contracts, elements of a valid contract, offer and
acceptance, capacity of the parties to the contract, types of mistakes encountered in contracts, misrepresentation, consideration, express and implied terms and statute of limitations. Contract documents: drawings, specifications, bill of quantities., General conditions of Contracts, Special Conditions of contracts. Types of Contracts-Supply, Semi Turn key, Turn Key contracts

15 Marketing Research

Demand – Supply analysis Identification of potential markets, Analysis of Competitors' positioning Pricing trends Performance-gap analysis Formulation of growth strategy