

Unit – IV

Lesson 10

CONCEPT OF TECHNOLOGICAL ENVIRONMENT

Technological environment is an important segment of macro environments which exert considerable influence on business.

Technology – It is a systematic application of scientific or other organized knowledge to practical tasks.

Science and technology enable man to conquer distance, control birth rate, save lives, generate, preserve and distribute energy, discover new materials and substitutes to existing ones, and introduce machines to do the work of human beings, substitute mental work with computers. Science and technology provide a man with lot of leisure and comfort.

Technology is the dramatic force shaping the destiny of people all over the world.

Technology is an important determinant of success of a firm as well as the economic and social development of a nation.

Technology includes both machines-

1. Hard technology and
2. Soft technology

It is available to solve the problems and promote progress among societies.

Technology is a systematic knowledge for the manufacture of a product, for the application of a process or for the rendering of a service and does not extend transactions involving mere sale or lease of goods.

CONCEPT OF TECHNOLOGY

Technology does not only include knowledge or methods necessary to carry on or to improve the existing production and distribution of goods and services, but also entrepreneurial expertise and professional know now.

Global competitiveness report of forum 1999 observed three aspects to increase its focus on information technology -

1. **E-mail**- which expand the possibilities for interpersonal, inter-firm and international communications.

2. **Internet-** which allowed for more extensive and rapid dissemination of information.
3. **E-commerce-** which offers a potentially huge increase in the customer base for companies and huge savings in marketing cost and search costs in finding low cost suppliers.

Competitiveness in all these areas is closely linked with the competitiveness of the local telephone infrastructures and with the penetration of the computer culture in the local economy.

Innovation

Innovation is a factor which provides competitive advantage and consequently determines success.

Forms of Innovation

Innovation is possible in any form like –

1. introduction of a new product
2. use of a new method of production
3. opening of a new market
4. conquest of a new source of raw material
5. reorientation of an industry

Innovation (in business context)

In business context innovation means- The technical, industrial and commercial steps which lead to the marketing of new manufactured products and to commercial use of new technical process and equipment.

Use of Innovation

Innovation helps companies to increase the market share, capture new markets, and create new market segments or to create entirely new industries and markets.

Innovation is expected to give a company a competitive advantage or success in the market.

Product and Process Innovations

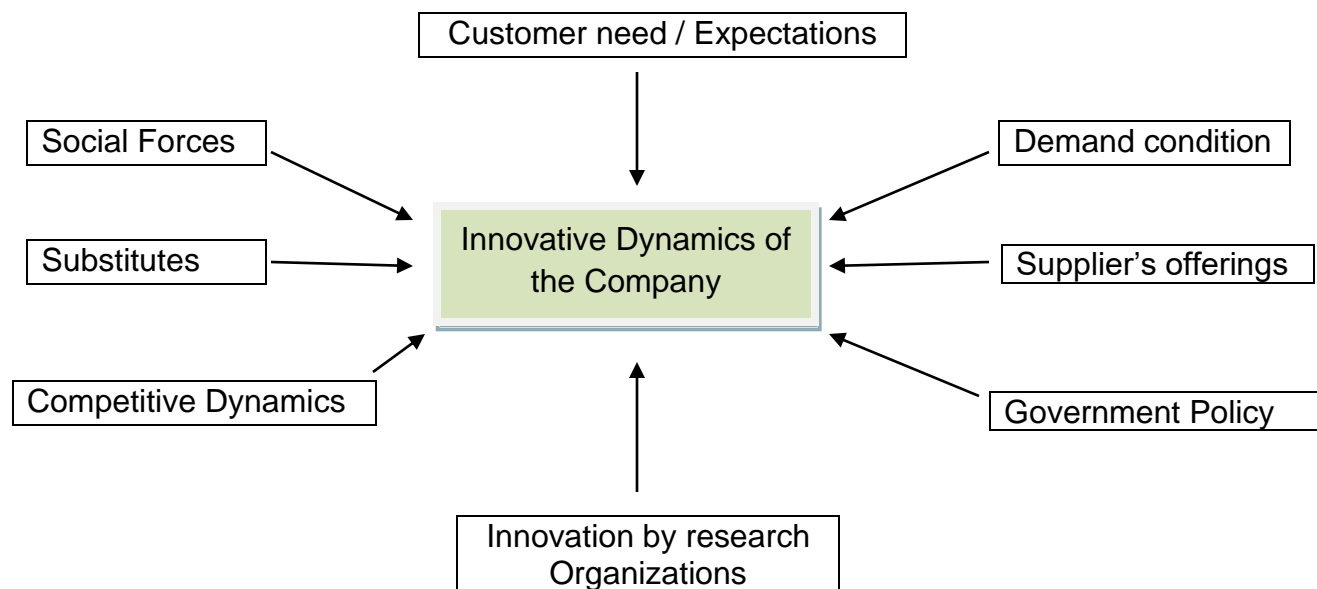
The pattern of early innovations in a new technology based industry firstly relates to production innovations (improving the performance and safety of the product), later innovations shift to improving the production process to make the product cheaper and with better production quality.

The rate of product innovations peaks at the time of introduction of a design standard for the new technology product. Thereafter the rate of innovations to improve the product decline and the rate of innovations to improve production increases.

Sources of Technological Dynamics

The sources of technological change may be internal or external.

Factors which generally determine the technological dynamics of a company are



1. **Customer needs/Expectations** – R & D efforts and technological orientation of any company are generally influenced by customer needs and expectations. This is because customers and suppliers have collaborative relationship to develop products or solutions. If the consumers are highly demanding, companies would be compelled to be innovative.
2. **Demand Conditions** – Besides customer needs/expectations different demand factors influence the technology choice. Example – the size of demand influences the choice of the technological scale. The fast growing trend of demand encourage adoption/ development of technology of large scale, it also encourages R & D efforts.
3. **Supplier's Offering** – sometimes technological changes are also possible by the suppliers of a company like – Capital goods, suppliers and other technology suppliers. The competitiveness of the Italian tile industry owes a lot to dynamic and innovative technology suppliers.
4. **Competitive Dynamics** – Competition always compels the adoption of the best technology and constant attempt to innovate. Absence or lack of competition generally indicates the major reason for the technological backwardness of

corporate area. After liberalization the impact of competition on technological improvement is very evident in many industries.

5. **Substitute** – Substitution is a function of the relative value to price of competing products and the switching costs associated with changing between them. Technological change creates entirely new products or products uses that substitute for others. Example – word processor for typewriters, and microwave ovens for conventional ovens. It influences both the relative value/price and switching costs of substitutes.
6. **Social Forces** – Social forces like protest against environmental pollution or other ecological problems, demand/preference for eco-friendly products need to tackle certain social problems which may prompt efforts to technological developments in certain direction.
7. **Research Organization** – Technological environment of the business is enriched by research organizations, including research departments of universities, which develop new technologies and provide other technical inputs.

Research Establishments in India –

- ICSR - Indian Council for Scientific Research
- CFTRI – Central Food Technological Research Institute
- DFRL - Defense Food Research Laboratory

Government Policy

Government often is an important actor in the technological environment. Government generally contributes to the development of technology, by its own direct involvement by establishing research organizations and funding R & D. Even Government also encourage private R & D by different incentives like tax incentives, subsidies etc.

Technology policy of the Government is a very important element of the technological environment.

Example – A government may favor or disfavor certain types of technologies. Government policy towards foreign technology is also a critical factor.

In countries like – India, the overemphasis on indigenous technology, had led to high costs and distorted developments. The policy bias in favor of small business has resulted in production unit of uneconomic size in many industries. The reservation of certain products exclusively for the small scale sector promoted different companies, including multinationals, to resort to strategies as franchising and contract manufacturing in some of these industries in India. The reservation of products for the small scale sector sometimes comes in the way of adoption of modern technology if it involves capital investment higher than the specified limit.

The failure to absorb modern technology has adversely affected the exports of several import items like – leather goods, textile items.

Technology can affect the location of production base and global trade flows.

Example – when the television technology was Labor intensive this encouraged the location of television manufacturing in the developing countries.

Advances in technology may also cause relocation of production.

SELF CHECK QUESTIONS

LONG ANSWER TYPE QUESTIONS:

1. What is technology? Discuss the sources of technological dynamics in present scenario.
2. Write an essay on the significance of technology in present environment.

SHORT ANSWER TYPE QUESTIONS:

1. Discuss the aspects of information technology.
2. Discuss the term innovation.

OBJECTIVE TYPE QUESTIONS:

1. Industrial policy resolution 1956 was adopted in India as the _____
 (a) Monopolist pattern of society (b) Communist pattern of society
 (c) Socialist pattern of society (e) Monopolist and socialist pattern of society
 Ans: (c)
2. Essential commodities act came in India from
 (a) 1951 (b) 1953 (c) 1955 (d) 1957
 Ans: (c)
3. New industrial policy 1991 heralded the _____
 (a) Socio-economic reforms in India (b) Political reforms in India
 (c) Economic reforms in India (d) Technological reforms in India
 Ans: (c)
4. Industries (development and regulation) act was promulgated in India from _____
 (a) 1945 (b) 1947 (c) 1951 (d) 1955
 Ans: (c)

Lesson 11

TYPE AND IMPACT OF TECHNOLOGY

Appropriate Technology and Technology Adaptation

When different technologies are available then it is the choice up to selection of technology/ perfect technology to ensure that the chosen is the most appropriate for the purpose of company/country development. The technology suitable in one environment may not be appropriate in a different environment. The reason is differences in natural factors as topographical conditions, climatic/ weather condition, soil conditions, differences in income levels, scale of operations, demand conditions, use facility characteristics, customer characteristics.

Intermediate Technology

Appropriate technology – (often implies intermediate technology) Intermediate technology is a technology which combines elements of traditional technology with the elements of modern technology which gained importance in developing countries.

Example – One multinational found reason for low demand for its washing powder in a developing economy. The reason was low quality washing machine ownership.

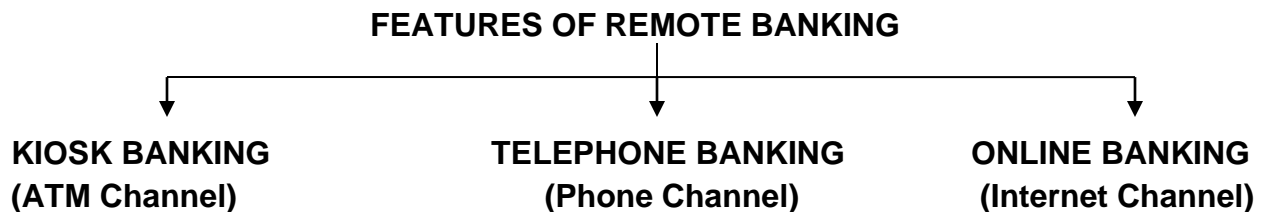
The low income and lack of electrification/unreliability of power supply decreased the washing machine ownership. In this connection the company asked its R & D department to develop a low cost, manually operated washing machine.

Benefits of Information Technology

1. Provides new ways to design organizations that can lead to structure like the technology form organization.
2. Creates new relationship between customers and suppliers who electronically link themselves together.
3. Enables tremendous efficiencies in production and service industries through electronic data interchange to facilitate just-in-time production.
4. Changes the basis of competitions and industry structure. Example – in the airline and securities industries.
5. Contributes to the productivity and flexibility of knowledge workers.
6. Provides the manager with electronic alternatives to face-to- face communication and supervision.

Technological Environment in the Banking Sector

- A. IT in Banking
- B. Remote Banking
- C. Technology and Bank Strategies
- D. Effect of Technology on Risk in Banking
- E. Delivery Channels and channel Migration
- A. **IT in Banking** – Financial sectors like – banks, stock exchange and insurance organizations have been the backbone of any country. Also they are agent to implement the economic reforms. Developments in information collection, storage, processing, transmission technologies have influenced the banking activities. IT developments affect banking in two ways-
 - a. Firstly, Technology contribute in the reduction of costs associated with the management of information like collection, storage processing and transmission by replacing paper based and labor intensive methods
 - b. Secondly, Technology modifies the ways in which customers have access to a bank's service and products through the use of automated processes as remote banking.
- B. **Remote Banking** – Relates to extending banking services without face to face contact between the bank employees and its customers.



ATM Channel – Customer uses multipurpose ATMs installed by the bank which may also be used as an interactive link between the customer and the bank.

Phone Channel – Telephone is used as a message carrier to enable person to person or voice-activated automated communication between the bank and the customer.

Internet Channel – Internet is used as message carrier where the customer uses a PC and modem (or local area network) to connect to the bank using its online website or software provided by the bank.

Banks can be categorized by their involvement in remote banking

- A. Banks that provide traditional services, but struggling with the new technology.
Example – most of public sector banks.

- B. Old banking institutions that offer traditional banking services and are moving on to offer remote services. Example – State Bank of India started offering telephone banking, online banking & ATM facility.
- C. New Age Banks that operate physical branches and use remote banking. Example – ICICI, HDFC they conduct their operation through remote banking.

Impact of Technology on Globalization

Global sourcing was encouraged not only by trade liberalization but also by technological developments which reduced transport costs. Technology monopoly like possession of patented technology encourages internationalization because the firm can exploit the respective demand without any competition.

The pace of globalization has been accelerated by different enabling technologies. Technological revolutions in different spheres like – transport and communication has given a great impetus to globalization by their tremendous contribution to the reduction of the disadvantages of natural barriers like – distance and cost.

The developments in the field of air cargo transportation have fostered globalization by enabling quick and safe transportation of sensitive goods. (Like – perishables and goods subject to quick changes in fashion/taste).

IT and Marketing

The business horizon is humming with buzzwords like – internet, World Wide Web (www), cyberspace, and information superhighways etc. which are changing the way of contacting customers; order receiving and processing and networking and integrating business system. The revolutionary changes being ushered in by the internet are indeed exciting.

Effective use of information technology helps a company to identify and profile customers, reach out to customers quickly and more effectively, and make inventory management and distribution system more efficient. Use of Information Technology in distribution reduce inventories, delivery time, Stock – outs and respond faster to market, reduce rush orders, cut down over production charges, reduce unnecessary movement, paper work and wasteful processing; it plans production better. These benefits result in improved service at a lesser cost.

TRANSFER OF TECHNOLOGY

Technology transfer is the process by which commercial technology is disseminated. Technology transfer transaction may or may not be a legally binding contract, but involve the communication, by the transfer of the relevant knowledge to the recipient.

Forms of Transfer of Technology

1. Internalized form of technology transfer
2. Externalized form of technology transfer

Internalized form relates to investment associated with transfer of technology, where control resides with the technology transferor. The transferor normally holds the majority or full equity ownership.

Externalized form relates to other forms like joint ventures with local control, licensing strategic alliances and international subcontracting.

In Internalized transfer of technology the transferor has important and continuing financial stake in the success of the affiliate, he allows using the brand name and to have access to its global technology and marketing networks, exercises control over the affiliate's investments, technology and sales decisions, and sees the affiliate as an integral part of its global strategy.

Externalized form generally lacks one or all of the entire features of internalized repercussion on transfer of technology process. Over time, the array of transfer of technology arrangements has diversified and particular modes have also become more flexible.

Levels of “Transfer of Technology”

1. **Operational Level** – at the bottom level for operating a plant, this involves basic manufacturing skills as well as some more demanding troubleshooting quality control, maintenance and procurement skills.
2. **Duplicative Level** – Duplicative skill situates at intermediate level which includes the investment capabilities needed to expand and to purchase and integrate foreign technologies.
3. **Adoptive Level** – At this technological self reliance level, imported technologies are adapted and improved and design the skill for more complex engineering learned.
4. **Innovative Level** – This level is characterized by innovative skills, based on formal R &D, that are needed to keep pace with technological frontiers or to generate new technologies.

Modes of Technology Transfer

Depending upon the type, nature and extent of technological assistance required, the transfer of technology may be-

1. Training or Employment of Technical Expert
2. Contracts for supply of machinery & equipment
3. Licensing Agreements
4. Turnkey Contracts

1. Training or Employment of Technical Expert

Fairly simple and unpatented manufacturing process/technique can be transferred by imparting the requisite training to suitable personnel. This technology can be acquired by employing foreign technical experts.

2. Contracts for supply of machinery & equipment

Which, normally provides for the transfer of operational technology pertaining to any equipment, and is often adequate for manufacturing process not only in small scale projects but also in different large scale industries where the nature of technology is not particularly complex.

3. Licensing Agreements

Under which the licensor enters into an agreement with a licensee in another country to use the technical expertise of the former is important means for the transfer of technology. Licensing agreements are usually entered into when foreign direct investment is not possible or desirable.

4. Turnkey Contracts

Transfer of complex technology often takes place through turnkey project contract, which include the supply of those services as design, creation, commissioning or supervision of a system or a facility to the client, apart from the supply of goods. Many times, combination of two or more methods is used. Turnkey Contracts are the most comprehensive combinations.

SELF CHECK QUESTIONS**LONG ANSWER TYPE QUESTIONS:**

1. Discuss the interface between technology and business.
2. What is meant by technology transfer? Discuss the levels of transfer of technology.

SHORT ANSWER TYPE QUESTIONS;

1. Differentiate between innovation and technology.
2. Discuss the modes of technology transfer.

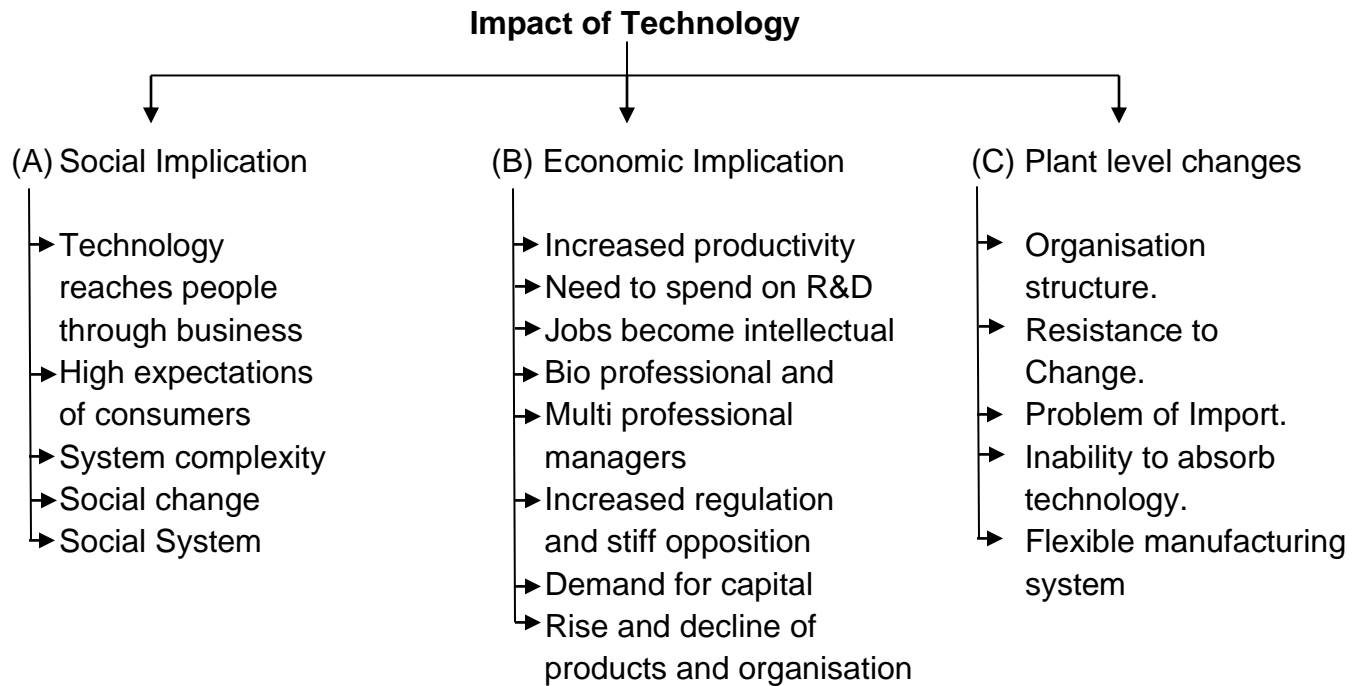
OBJECTIVE TYPE QUESTIONS:

1. The industrial policy 1956 has been hailed as the _____
 (a) Social constitution of India (b) Political constitution of India
 (c) Technological constitution of India (d) Economic constitution of India
 Ans: (d)
2. In India, presently the policy environment is more conducive for _____
 (a) Domestic investment (b) Foreign investment
 (c) Public investment (d) Domestic and foreign investment
 Ans: (d)
3. The industrial policy 1956 came in India for -
 (a) Appreciation (b) Criticism (c) Appreciation & criticism (d) none of these
 Ans: (c)

4. New industrial policy 1991 facilitated _____
- (a) Easy access to foreign country and flow minimum capital
 - (b) Easy access to foreign technology and foreign direct investment
 - (c) Easy access to foreign business and foreign trade investment
 - (d) Easy access to foreign communication and foreign direct investment
- Ans: (b)

Lesson 12

RELATIONSHIP OF TECHNOLOGY AND SOCIETY



Technology and Society

Technology is formed on society. Practically every area of social life and the life of every individual has changed by the developments in technology.

Technology reaches people through business institution through which they expect new discoveries converted into goods and services. Manager pools the resources and works on new discoveries to convert them into useful products. Printing, housing, education and television all depend on business activities to make them work productively. Society depends on business to keep the stream of discovery flowing into useful goods and services for all mankind.

High Expectations of Consumers –Technology contributed to the emergence of affluent societies. Society expects varieties of products- superior in quality, free from pollution, safer and more comfortable, these are to be produced and supplied to the affluent sections. This calls for maximum investment in R & D.

3. System Complexity

Technology provides complex modern machines work better and faster. But if they fail they need services of experts to repair. They often fail because of their complexity. A

machine or a system is composed of different hundred components. All parts must work in tandem to accomplish a desired task.

Failure of power supply, for example dry water taps, closed petrol bunks, dark house, dead TVs, closed retail establishments and other.

A localized problem in a power house balloons into a regional problem affecting thousands of people, it is possible that technology, might eventually lead to simplicity and small independent operational units.

4. Social Change

Role of Social change may be in more than one way –

The first is change in social life which results from a change in a technological process.

Technological changes create a constant turmoil in society, with socially uprooted, mobile population drifting about in search of new centers of employment.

Secondly, besides uprooting population, technology directly changes the patterns of their social life, for instance the family, the sensitive recorder of all types of change, alters with technological family development.

Invention may open new appointment opportunities to women, radically change hours spent at work and in the, increase available leisure time, open jobs to youth, and deny them to middle aged or old workers.

Technological development may basically change the stratificational system of a community. Skilled jobs carrying great prestige may be destroyed. Jobs may be open to members of low ranking or racial groups.

Thirdly, technology flows to less developed countries mainly through multinational companies, with vast resources at their command. Multinational Corporations have carved out places and images for themselves distinct from local companies.

5. Social Systems

Technology creates social system as knowledge society. In knowledge society, transfer and use of knowledge and information rather than manual skill dominates work and employs the largest portion of labor force.

In the knowledge society, relationship between the knowledge of worker and the organization is strange and amorphous, redefining itself all the time. He creates new jobs in consultation with his employer.

TECHNOLOGY AND ECONOMY

1. **Increased productivity** – the main reason for the adoption of technology is greater productivity in terms of quality and quantity. Example – In a factory, objective may be quantitative i.e. more production at less cost.
2. **Need to spend on R & D** – R & D assumes considerable relevance in organizations as the technology advances. In this context firms are required to pander over and take action on at least six issues.
 - (i) Allocation of resources to R & D (giving market share in global competition).
 - (ii) Technology transfer (The process of taking new technology from the laboratory to the market place is equally important. This transfer takes longer time as organizations grow in size)
 - (iii) Time factor is important in R & D i.e. the time between innovation and commercialization.
 - (iv) Technological discontinuity (as the new technology comes; the old technology needs to be abandoned).
 - (v) Decide on own R & D or to outsource technology (firm can tap the R & D capabilities of competitors, suppliers through contractual agreements as licensing).
 - (vi) Bio – technology and R & D -Bio technology is the application of scientific and engineering principles to the processing of materials by biological agents to provide goods and services.
3. **Jobs become more intellectual** – A job hitherto handled by an illiterate and unskilled worker now requires the services of an educated and competent worker.
4. **Need for Bio-professional and Multi-professional managers** – Technocrats who assume reins of administration need to be qualified in management education in addition to the proficiency they acquired in the fields of specialization.
5. **Increased Regulation and Stiff Opposition** – A by- product of technology advancement is the ever-increasing regulation imposed on business by the government of the land and stiff opposition from the public. Government has the power to investigate and ban products that are directly harmful or hurt the sentiments of a section of society.
6. **Insatiable demand for Capital** – Today's technology is characterized by its insatiable demand for capital. Business organizations should not only raise huge funds, exploiting all ways and means the mobilized funds must be judiciously employed for gainful purpose. This calls for honest and efficient financial management.

- 7. Rise and decline of products and organizations** – A new technology may spawn a major industry but it may also destroy an existing one.

PLANT LEVEL IMPLICATIONS

1. Technology and Organization Structure where companies use technology which is fast changing, matrix structures are more common. Some companies use a matrix even though the rate of technological change is not fast. Besides technology other factors which influence on organization structure are 'history and background of a company and the personalities of the people who founded the firm and managed it subsequently but the impact of technology is considerable'. In mass production technologies the number of people whom an executive controls tends to be larger than when the production is unit based.
2. **Resistance to Change** – New technology poses new problems which may not be to the liking of the organizational people. The resistance to change is purely psychological. A typical businessman himself opposes to new technology. He does not encourage new technology. The reason is not only psychological but adopting new technology is expensive and risky.
3. **Problem of Importing Technology** – Management face problems in case of import of technology. For example – basic infrastructural facilities like training of technicians and supervisors, testing facilities for raw materials, replacement parts are not easily available.
4. **Inability to Absorb Technology** – Ability to absorb western technology is low in our firms, for e.g. Bullet, 350cc motorcycle manufactured by Enfield India could not be there for a long time change. The company could not adopt the design (supplied by European company) for relatively minor change.
5. **Total Quality Management (TQM)** – Relates to deep commitment of an organization to quality. Quality of product and service is an obsession and every step in the company's processes is subject to regular scrutiny for ways to improve it. Almost every issue is subject to exploration, and the process is a continuing one of long duration. Employer provides extensive training in problem solving, group decision making and statistical methods.

TQM Replaces Traditional Beliefs about Quality with a new set of principles –

1. High quality costs more
2. Quality can be improved by inspection
3. Defects cannot be eliminated completely
4. Quality is the jobs of quality control personnel

New Principles of TQM

1. Meet the customer's requirement on time, the first time and 100% of the time

2. Strive to do error free work
3. Manage by prevention, not by correction
4. Measure the cost of quality

Managers are required continuously to search for improved policies and activities. Employees can not take longer rest on their past achievements.

Business Process Reengineering (BPRE) – BPRE involves considering how things would be done if the organization were to start all over from scratch. Michael hammer is the father of the process re-engineering.

TQM and BPRE have identical objective search for excellence in serving the customers. They differ in the means they adopt to reach the goal.

- TQM seeks to improve essentially what is good
- BPRE seeks to reject what is irrelevant and starting afresh.
- TQM is essentially a bottom up approach
- BPRE is driven by top management

Organization can survive the competition if it can cut down its costs, eliminate waste and improve its quality. Reengineering helps the organization achieve all time.

Flexible Manufacturing System (FMS)

FMS is another by-product of technology under FMS; machines are designed to produce batches of different products.

The unique characteristic of FMS is that by integrating computer aided design, engineering and manufacturing, they can produce low volume products for customers at a cost comparable to what had been previously possible through mass production.

FMS is rewriting the laws economics of scale. For a longer time management cannot produce on a massive scale to achieve low unit cost of production. With flexible manufacturing where management wants to produce a new part it does not change machines it needs to change the computer programming

SELF CHECK QUESTIONS

LONG ANSWER TYPE QUESTIONS:

1. What are the factors which are kept in mind while selecting the level of technology for business?
2. Discuss how economic development is related with technology?

SHORT ANSWER TYPE QUESTIONS:

1. Discuss the significance of technology in social environment.
2. Differentiate between Bio-technology, Research and development.

OBJECTIVE TYPE QUESTIONS:

1. The Indian stock market is open for investment by foreign institutional investors since_____ (a) 1991-92 (b) 1992-93 (c) 1993-94 (d) 1994-95 (e) 1995-96 (f) None of these
Ans: (b)
2. The industrial policy 1956 set out some principles of_____ (a) Gandhi's philosophy (b) Nehru's philosophy (c) Ner Singh Rao's philosophy (d) Bajpai's philosophy
Ans: (b)
3. EXIM policy 1992 as a part of ongoing economic liberalization announced in India with effect from_____ (a) 1st January 1992 (b) 1st April 1992 (c) 1st August 1992 (d) 1st December1992
Ans: (b)
4. The Foreign Trade (Development and Regulation) act 1992 replaced the existing business act namely_____ (a) Import and Export (Regulation) act 1947 (b) Import and Export (Control) act 1949 (c) Import and Export (Regulation & Control) act 1947 (d) Import and Export (Control) act 1947 (e) None of these
Ans: (d)