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TITLE: "GLOBAL TECHNOLOGICAL ADVANCES AND THEIR EFFETCS ON NATIONAL DEVELOPMENT"

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GLOBAL TECHNOLOGICAL ADVANCES AND THEIR EFFECTS ON NATIONAL DEVELOPMENT

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1. Technology Needs

1.1 Technology has become the key for development. In what ever form certain activities are being carried out, one would observe that technology is making inroads and brings about perceptible transformations. It can be said that technology has become the most effective tool for competitiveness. To meet societal needs technology has become all important and more so in countries with large population such as India. The societal needs can be met only with a high degree of efficiency possible thorough the use of appropriate Technology.

1.2 Remarkable achievements in science and technology has transformed the way basic human needs are being met in area of food, shelter, health and clothing. It may also be pointed out that many new Technologies are effective only for a short period of time and thereafter a new Technology takes over to meet a felt need of society.

1.3 It is also recognised that there are difficulties in start up operation involving the introduction of new Technologies. This position is aggravated by the need to keep the technology improved with suitable increments and finally it will be recognised that the time has arrived for using an entirely new Technology. Technology need not be viewed in the context of emerging and new high technologies only; it could be seen in the context of providing employment, cost effective solution to day today problems, drudgery reduction, increasing productivity and those required to meet other day today requirements. Perhaps the most important characteristic of a new Technology can be seen in the cost effectiveness and its ability to give a competitive edge in the market.

2. Technology sources

2.1 The societal needs is the push for a new technological innovation and the birth of a new technology. However technology generation often involves relatively large costs not only in the scientific and technological manpower cost but as well as for the cost involved in commercialising the inventions. Very few countries have all technology required by them developed in their own country. One society may also find that technology developed by them may find applications in several other societies, often separated by oceans and mountains. Modern technological advances has made distance no longer a relevant factor. Such a transmission results in a larger market than the domestic market in which a technology is generated. One may thus observe that the developing countries not having adequate resources for technology developments often resort to shortcuts by acquiring Technology developed elsewhere and to meet the immediate needs of the society. This has advantages as well as disadvantages and as such when one is looking for new technologies he will examine the options of developing an indigenous technology or importing a technology from abroad.

2.2 The indigenous technology utilisation has several problems and many of them can be traced to the proven status of the technology. However over a period of time some of the indigenous technologies gets proven and later they are available for transfer. The indigenous technology sources in India can be identified in the Universities, I.I.T's, Engineering colleges and such other places of higher learning. There are in fact more than 300 institutions under the control of Central Government such as those with CSIR, DRDO, ICMR, Atomic Energy, Department of Space and many other ministries.

2.3 [illegible] consultants are a source of technology. They have experience of building and putting up [illegible] of a wide range of infrastructure with plants and machinery. Consultants have the advantage of knowing the good and bad related to a particular technology.

2.4 Yet another source of technology are the recognised in house R&D centres, particularly the large public sector undertakings are source of Technology for many of the ancillaries that are set up around them by the private sector industries. A few private sector industrial units also do Transfer Technology when they sub contract to produce supplies to their main factories. Further, when they diversify they transfer the technology for existing line of production to other industries.

2.5 In a recent study it was estimated that role of indigenous technology relating to industrial production was still relatively small. May be only of the order of about 5% of total industrial production. Thus a very large part of industrial production in the country is either based on the imported technology or technologies which after a period of import has been indigenised

2.6 The major technology source to India in the field of industrial production are companies from a few developed countries, many of them being units of the multinational corporations. Some of them supply technology to the units which they have established in the country following their direct foreign investment; but very large number of them supply technology through licensing arrangements. Since independence India has had more than 17000 such technical collaborations; in the last few years the number of such collaborations have been 1500 per year. Major suppliers of technology to Indian companies are from USA, Germany, UK and Japan. In fact the above four with Italy, France, Switzerland and other Nordic countries account for almost 90% of the technology supply to India.

3. Access to Technological Information

3.1 Before one proceeds to discuss the issues relating to access to technology it is desirable to have some ideas about the availability of technical information and access to it. Absence of such information could be a major barrier to access to useful Technologies.

3.2 Technical information being a very valuable item is now traded through various agencies. Very often the agencies who implement project have built up their own technology data so that the customers when choosing a project agency, the necessary technological information is provided by the project executing agency, and if required, the executing agency acquires technological information from other sources. In India many State Industrial Development corporations have some data relating to their industrial activity, many of them do not contain all elements that constitute the necessary parameters of technological information. Similarly many technical consultancy organisation also have information on projects executed by them. NRDC has arrangements with major technology generators in the country and can provide fairly good information packages on a wide range of technologies developed in the country. Many industry association namely FICCI and CII have attempted to provide technological information provided by the industries.

3.3 Mention has to be made at this stage of the information contained in patent specifications which can be a source of effective technical information. Government of India has established a patent information system in Nagpur and a wide range of services are now available from this source.

3.4 Currently, with the advent of online systems working across national boundaries, it is possible access technical information from many data banks established in many countries. For example the APCTT has linkages with over 1000 agencies outside India; information received therefrom are updated in its data bank. APCTT also has standardised the technology information format so that a fair amount of data useful for decision making will be available. For example the standard heading will include. a brief description of technology, area of application, advantages, stages of developments, names of countries where commercialised, input requirements, manpower requirements, production capacity, raw materials, economic data, transfer mechanisms, target countries and payback period.

3.5 Other UN bodies have also supported systems to provide technical information to meet the needs of technology in developing countries. Thus TIPS (Technology information promotion system) has been established and there is a national branch in Delhi, India. UNIDO has attempted to provide technical information through INTIB which has promoted technologies through arranging Techmarts in different parts of the world. Similarly there are many national agencies in different countries such as British Technology Group in UK which can provide technological information. In addition there are a very large number of private agencies who sell technology information.

4. Issues Relating to Access to Technology

4.1 In this section problems encountered in accessing technology will be briefly touched upon, in particular, as applicable to indigenous technology.

(i) Indigenous technology development in India is characterised by a very large amount of data being available through the funding provided by the Government. Since many of them enter public domain without appropriate industrial property protection, they are generally useful as knowhow only, a very small part of the technology developed is protected by intellectual property. This poses problems for the investor having free access to technology but unable to make investment decisions for fear of competition from others in the absence of protection. This position is improving and is expected that added industrial property protection will improve investment on indigenous Technologies.

Another major problem relating to indigenous technology is that it is not always [illegible] commercial [illegible] technology indigenous [illegible] and this has [illegible] venture [illegible] a high risk [illegible] high returns when [illegible] successful. Fortunately some awareness is coming [illegible] and it is possible many [illegible] technologies may become accessible to entrepreneurs in India through this route.

(iii) Another problem relating the use of indigenous technology in the country is contemporariness; the fact that the technology is easily accessible is no longer a qualification since preference for products will be judged by the consumer on merits.

(iv) Yet another problem is the lack of financial support when the technology is of indigenous origin; many financial institution just are not interested in an indigenous technology, when they can deal with proven imported technologies.

4.2 Many technologies though available abroad are not accessible for use in another country

(i) One major concern relating the access of imported technology can also be traced intellectual property protection. Many companies anxious to protect their technology from piracy are not willing to give access to their technologies to Indian entrepreneurs. This is particularly felt, in high technology domain, for example pharmaceutical.

(ii) Another consideration that has come about in the last 3 years in connection with of technology supply is the fear of dual use of the technology. The suppliers are now insisting that the technologies provided will not eventually be used in areas having military applications.

(iii) Political pressure groups also make access to technology difficult. Some concern can be traced to the missile control technology regime in which countries like USA insist on export clearances. In fact they exert pressure on other countries as well to stop the flow of certain technologies.

(iv) Genuine problems arise in sizing. Many new entrepreneurs in the country have limited market but the scale of technology available abroad are to cater to very large volumes of production. They are unable to locate the technology at a suitable size and very often have to down scale with the support of local Engineering or Chemical Consulting Organisations.

(v) Some technology is already embodied in capital goods. Such embodied technology have special characteristics, resulting in large volumes of production, skill of operations, and degrees of automation. This makes it difficult to get technology of the right type: older vintage of capital goods are very often no longer competitive in the market.

One may add [illegible] issues relating to financing as a hurdle to access technology. [illegible] items are extremely expensive. Items of foreign origin have also import duty payments based on a high c.i.f. value.

4.3 All in all access to technology to a developing country from a foreign source is no longer a simple issue. Considerable preparations and contacts through appropriate linkages are very necessary to ensure that the access to technology is well assured.

5. Specific cases

5.1 Technology for Small Scale Industry

Small Scale Industries contributes a sizable part of total industrial production. This is so not only in India but in many other countries as well. Assuming they have come into being some how many small scale industries face extinction because of wide range of problems of which technology upgradation is a very important factor. They cannot change the technology easily but should endeavour to upgrade the technology in a continuous manner. Access to such technology upgradation is a very special problem of small scale industry.

5.2 Environmentally Sound Technologies

While small scale industries have a major role very often they have earned the bad name as being indifferent to the concerns of the environment. They seem to escape the "Polluter-Pays-Principle". The requirement of environmentally sound technologies is therefore very important in the case of small scale industries. Access to clean technologies particularly those required by the Small Scale industry poses special problems. Clean technologies required in many polluting industries, not necessarily Small Scale units has also become a problem since many of the cleaner technology are privately held and issue relating to IPR is acting as barrier. Recent efforts in different parts of the world, particularly the work of the UN's commission on sustainable development is examining many new initiatives to facilitate the access to such technologies. These include concepts of One stop shop, Best practices guidelines, EST rights bank, BOT, establishment of ITTAs (Independent Technology Transfer Associations).

5.3 Technology Access to Women Entrepreneurs

Technologies of special interest to women entrepreneurs in rural areas has been studies by APCTT recently. A variety of problems have been identified and this centre has brought out a Facilitator's manual which may be of particular interest to women entrepreneurs in reaching to appropriate technologies.

5.4 I am enclosing a few transparencies to illustrate the subject-matter and bring out the impact of global advances of technology on the world of today.

PATENT APPLICATIONS. 1991.

JAPAN	380 000
U S A	177 000
GERMANY.	109 000
Fr. Sov.	84000
U. K	96000
FRANCE	79000.

	FOREIGNERS.	
JAP.	11.7%.	15.5
USA	49.8%.	46.3
		GRANT

RESEARCH PERFORMANCE.

TECHNOLOGY TRADE BALANCE

COUNTRY.	EXP *	IMP *	RATIO
USA 92	20200	5000	4·05
JAPAN 92	3100	7200	0·44
GERMANY 91	1500	3200	0·45
FRANCE 91	1500	2600	0·69
U. K. 90	2000	2100	0·96

* m. US$.

	JA	US	GE	FR	UK
JAP		0·39	0·53	0·50	2·27
USA	4·63		4·72	4·59	1·60
GER	1·75	0.23		0·89	0.22
FRA	3·52	0·19	1·66		0·68
U.K.	-	0·54	-	-	

IN HOUSE R & D

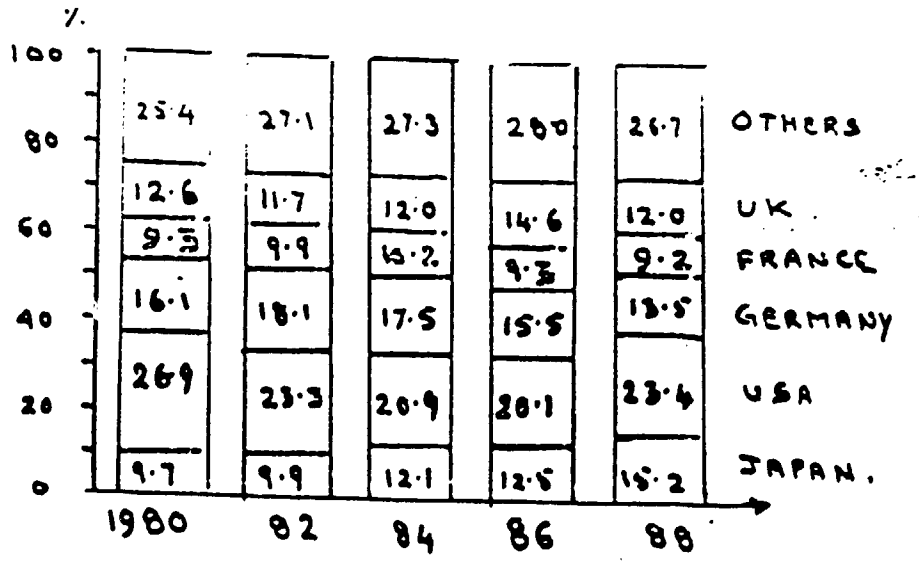
1991.

	JAPAN	INDIA
NUMBER OF UNITS	14100	250
R&D EXP. % Sales	2·78	0·7
ELEC/MACHINE	6·3	1·2
CHEMICAL	5·2	1·8
PRECISION INSTS	4·9	-
TRANSPORT.	3·4	-

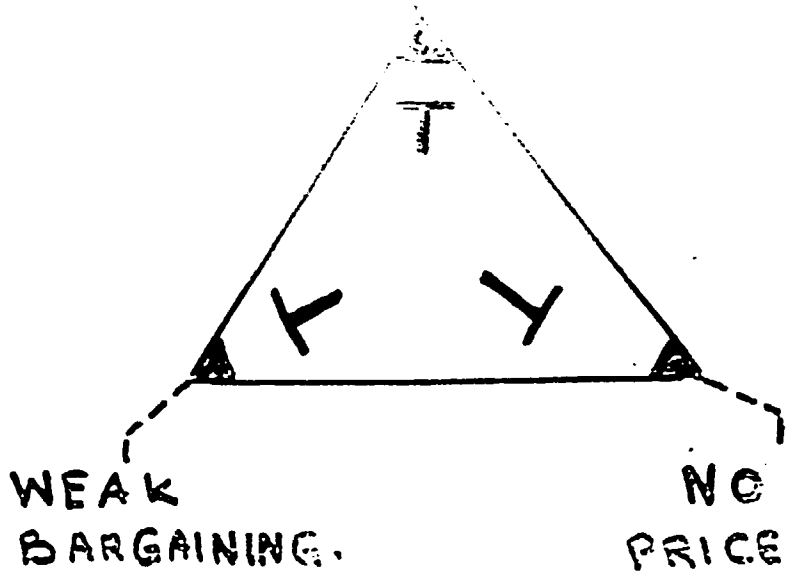
HIGH TECH. TRADE SHARE.

OECD 1980 (%)

SEGMENT	JAP	USA	GER	FRA	UK	OTHER
AEROSPACE	3.6	55.3	[illegible]	13.7	13.5	8.5
OFF. MACHINERY + COMPUTERS	37.5	34.8	5.4	2.5	8.1	11.6
ELEC. COMPONENT	42.6	30.6	10.0	4.4	6.2	6.8
DRUGS/MEDI	20.3	29.2	10.9	3.9	9.9	25.8
PRECISION INST	15.4	53.4	11.1	6.1	5.9	8.1
TOTAL	29.2	35.9	9.4	4.7	8.6	12.3

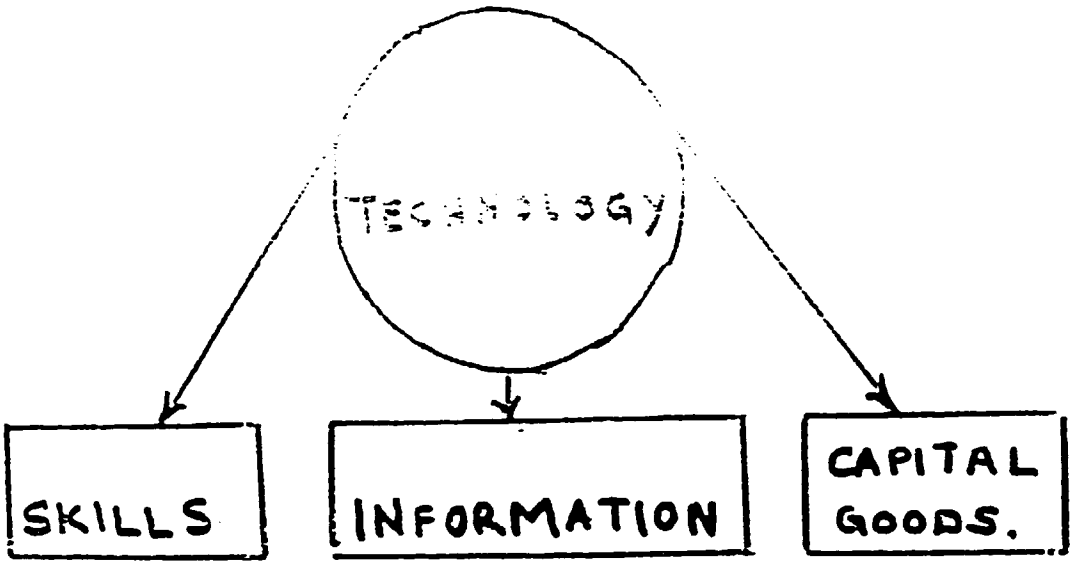


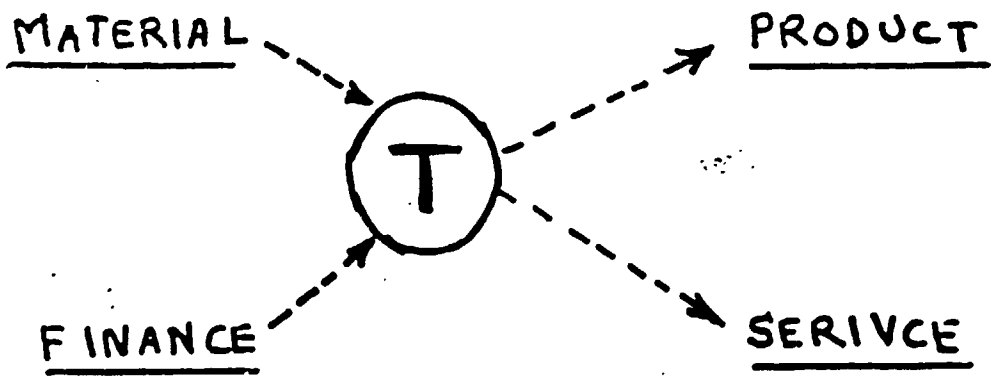
TECHNOLOGY IMPERFECT MARKET



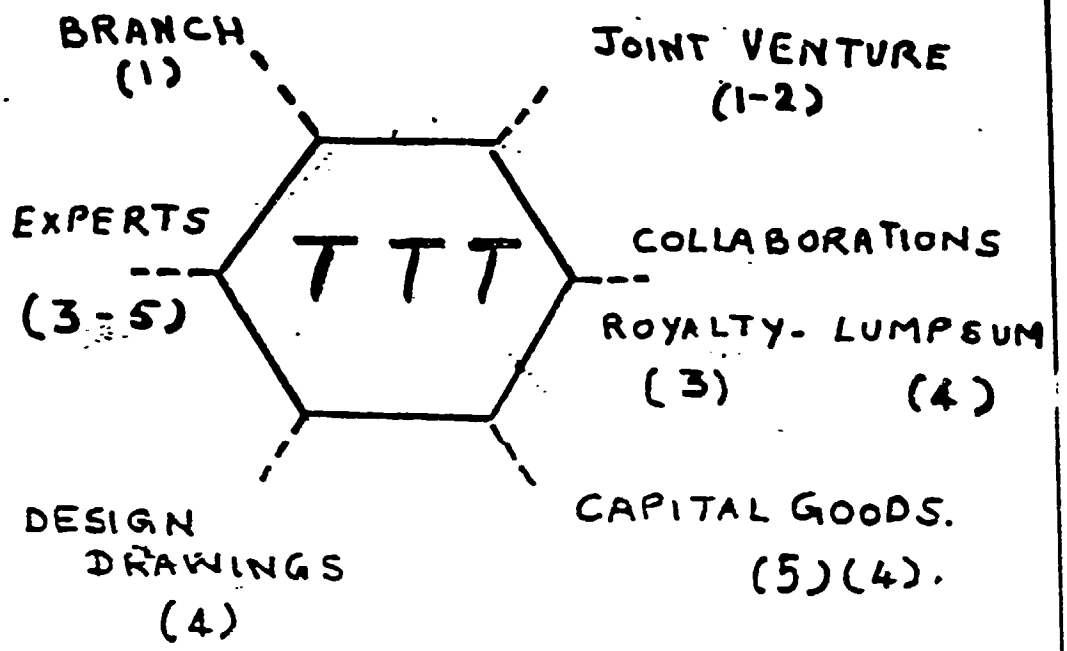
- SCALE
- SKILLS
- GUARANTEE
- RESTRICTIONS
- MODE OF PAYMENT
- TIED COMPONENTS
- TYPE OF TRANSACTION.
- LINKED TO ASSISSTANCE

TECHNOLOGY. HOW EMBODIED?





TECHNOLOGY TRANSFER . TYPES.



1. PERPETUAL
2. LONGTERM
3. SHORT TERM
4. ONE TIME
5. INCIDENTAL.

VERTICAL

TOT IN 1990's.

EMERGING : MICRO ELECTRONICS
BIO TECHNOLOGIES
NEW MATERIALS.
NEW APPLICATION
INFORMATION TECHNOGY.

LOSS OF COMPARATIVE ADVANTAGE.
- LOW LABOUR COST
- RAW MATERIAL / COMMODITY
- NEW TRADE BLOCKS

NEW ISSUES.
- ⓐ INTELLECTUAL PROPERTY
- ⓑ ENVIRONMENT.
- ⓒ POLITICAL ORDER.

OPTIONS.
- X INTER DEPENDANCY
- X NEW FORMS OF COOP.
- X ?