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Assessment of technology for appropriateness

Transfer of technology is an important factor in the development of all nations not belonging to the group of highly developed countries, i.e. for the so called developing countries, the former socialist countries and some of the smaller western countries. But success of such transfer can only expected, if the imported technology will be absorbed and bring the same or nearly the same results and effectiveness as in the source country.

Success in these countries must appear at two different levels: at the "macro" or national level and at the "micro" or company level. Success at company level means that the company implements the project within the time, within the budget and at the quality expected and set, lucratively enters the market and continues to stay competitive and lucrative.

Success at the nation-al level means that the new technology improves the employment situation, adds up to development in related industries, increases professional skills, improves the balance of payments and improves the quality of life of the people.

Technology may be exchanged between two companies at identical level belonging to countries of similar level, but in the majority of cases, technology flows from a more developed country and company to a less developed company of a less developed country.

If we consider an analogy with the free flow of water, this fact seems to be quite natural.

Is it also true that the greater the difference in height between the two points, the better will be the flow?

Definitely not, the analogy ends here and it is just the other way round: the greater the difference, the poorer will be the transfer or transport.

Analysing the factors that have or may have a role in a failure of a transfer or transport shows them as follows:

Commercial factors
- Wrong assessment of market
- Wrongly selected plant capacity /too small or too big/

Techical factors
- Poorer or different materials
- Poorer or different utilities

/-2

- Poorer skills - in quality and number
- An imperfect scaling-down of the technology to adapt it to the different conditions
- Poorer maintenance

Infrastructural factors- Poorer telecommunication system
- Poor computerization
- Poorer system of documentation
- Poorer system of information
- Poorer system of intellectual property
- Poorer system of repair possibilities
- Poorer system of acquisition of material and of spare parts
- Poorer system of training
- Scarcity of foreign exchange and all consequences thereof

And:
- A wrongly conceived, unbalanced, incorrect contract
- An inadequate preparation and implementation /organization/ of the project and of the contract.

Even without such factors for failure, it is in general difficult to transplant a technology from one environment to another. Consumer customs, state regulations concenring products may be different material qualities may be different, proficiencies of the technical staff may be different. This could happen even in cases, where both partners belong to the higly developed countries.

This means, that the technology must be "reworked" or adapted to the new environment - before the transfer. Such adaptation is of course not easy, because the transferor does not know well the conditions of the recipient, and the recipient does not know well the technology which will not be fully disclosed to him only after the contract is signed and the first payments are made.

Such reworking of the technology may involve at teast three tasks:

- A scaling down of the technology to meet requirements of the new market /perhaps to a smaller capacity - with a minimum of "penalties" in product quality and economic efficiency;

- A redesigning of the technology so that it combines scarce inputs in ratios which are economically rational in the new environment;
  and
- To ensure the maintainability of the technology or its absorption at the skill levels obtainable or trainable in the new environment.

The transferor has no means to get assurance that such attempts will work effectively and efficiently. This means risks that must be borne by the recipient.

The degree of such risks will vary from technology to technology, from country to country and from compnay to company, and consequently there are different levels of appropriateness and of risks.

Technologies may be grouped according to very different aspects. One of them is to make a distinction according to their "sensitivity to process":

- Industrial areas - and technologies - essentially non-sensitive to process /also named: "open-architecture type of technologies"/
  Such are: Manufacture of components, of mechanical appliances, of simpler machinery, of simpler consumer electronic, of cosmetics, mining etc,

- Industrial areas - and technologies - essentially sensitive to process /also named "closed-architecture " or"closed-system"/ technologies.
  Such are: chemical, metallurgical industries, electronic pro+

While experience shows that a big difference between the source and the recipient countries does not favour an efficient transfer, experience also shows that even in a country where the environment is much poorer than in the source country, a particular industry may quite be capable to well absorb technologies. Examples: the textile industry in India, the microelectronic industry in Korea. This means, that these technologies proved to be appropriate for the given transfer or transplantation.

+ ducts, sophisticated mechanical and electrical machinery etc.

It is therefore most important to first assess, what technology to select, to find the most appropriate one. As follows from those said above, a technology is then appropriate, when it can be absorbed with nearly that excellence and competitiveness as it had at the propriator and at the minimum technological risk level /not speaking now of commercial and other risks/.

Our present subject is therefore: How to assess - at least qualitatively - whether a technology is appropriate, or which of the technologies in the offer is most appropriate.

And to do this in a situation, when it is clear that all confidential details concerning the technology will only be disclosed by a transferor after the contract has already been signed.

It can be stated in advance, that it is much easier to assess a technology that is essentially non-sensitive to process or open-architectured for the following reasons:

- The product can be disassembled and the material and the probable sequence of manufacturing operations established.
- Manufacturing machinery is usually custom-made and standard.
- The manufacturing or process know-how is not sophisticated.
- The risk area can be identified.

With the other category this is quite different and not that simple

Nevertheless, in both cases it will be necessary to get some more disclosure from the propriators of the technologies and their cooperation. This can only be achieved if they obtain an appropriate confidentiality declaration or agreement, according to which such data and information will exclusively be used for evaluation and will not be used for any other purpose, and if they get some sort of assurance or indication that it is seriously and honestly meant by the recipient to go on with the project and sign the contract with one of the competitors, should one of their technologies be found appropriate.

Such cooperation must be based on a serious "homework" of the recipient, on a thorough study of the subject with the correct preparation of lists of essential questions for which answers are seeked. It is most advisable to have the assistance of competent persons or organisations /engineering companies/ in the case of more complex technolgies.

The selection and decision process is in each and every case of investment an iterative process, that has to be repeated as more and more information is collected and evaluated. Almost every repetition means that some of the technologies or offers are discarded and the repetition is based on deeper and broader circle of information.

The decision process can be seen in Annex 1. in the form of a decision tree, in which our present concern is Step I.

REMARK: We do not deal here with the case when for one reason or other /e.g. lack of information on other possible suppliers, lack of financing with a foreign credit offered but linked to taking a certain technology from a supplier in the country of the creditor, a monopolistic position of the technology suppler, etc./ only one single technology offered is or has to be considered and no competition is seeked for.

The assessment starts with preparing a checklist.

Illustrative examples for checklists for an "open-architecture" /essentially non-sensitive to process/ and for a "closed-architect ture" /essentially sensitive to process/ technology are shown in Annexes 2. and 3.

Sources of information, collection and evaluation of information is a most important part of project preparation also influencing the selection of the appropriate technology and its supplier and assessing their appropriateness and the risks factors involved. Since there is no room here to discuss this subject, reference is made here to Chapter V.8. "Sources of information" of UNIDO's Manual for Technology Negotiation.

The assessment of appropriateness is strictly linked and made parallel with the assessment of the technological risk factors.

The risk factors for the entire project, of course, do not differ from those mentioned as having a role in a failure. What is though of here, are only those associated with the technology itself, and even in this repsect, those additional to these technology-associated risks that are always present in the construction of a new plant and in transplanting a technology to another environment.

Identification of such technology-associated risk factors is an organic part of project preparation and one of assessing technologies for selection. To work out the strategy for risk minimization is a complex jcb involving project-planning, tests carried out with starting materials /in given cases lab or even pilot-plant tests/, thoughtful wording of good warranties, pre-testing of critical equipment, a good preparation of the market, a good organization of the implementation of the project, a clever insurance system etc. /Reference is also made here to Chapter VI.2 "Success factor for transfer of technology" in UNIDO's Manual for Technology Negotiation/.

The following assessment methods are suggested:

- The Comparative Costing Method
- The Ranking Method /both unweighted and weighted/
- The Points System Method.

The Comparative Costing Method

See Annex 4.

This is an analysis of all technology-associated investment and operating costs, of the production costs and of the expected profits based on data of the suppliers, at the plant capacity indicate as being economic by all offers.

This analysis is a general cost estimate required for any project and is as such very important. Its disadvantage is that it does not provide sufficient insight into those restraining factors that may have importance in the final decision.

Consequently, it must be completed by other assessing methods.

Ranking methods

The purpose is to find out which of the offered technologies is mos advantageous from the point of view of national restraints, such as free currency, fuel oil, electric power, water, certain starting materials, skilled labour, protection of environment.

The simplest method is the unweighted ranking, the moral of which is that the technologies are being compared with a view to the most important or all of the most essential restraints in the given country by giving proficiency marks /ranks/ to each of the competin technologies, with the highest number /equal to the number of tech-

/-7

nologies compared/ assigned to the most proficient one in the use of a selection parameter /maximum national investment input, less use of natural gas, power, etc./.

Parameter	Technology source A	B	C	D	E
Investtment in national currency	3	1	2	4	5
Imported raw materials	3	1	1	4	2
Fuel gas	4	3	5	2	1
Electric power	1	2	3	4	5
Skilled labour	2	2	1	3	3
Sum of rankings	13	9	12	17	16
Unweighted rank	3	1	2	5	4

The example shows that Technology C is most proficient in the use of fuel gas, while it is poor in the use of imported raw materials and currency. Technology E is best in the use of national equipmen inputs, but poor in the use indigenous raw materials and in the conservation of fuel gas.

This ranking gives already some useful indication, but offers litt le support to a more realistic analysis, since it assigns the same weightage to all of the scarcity factors.

Nevertheless, it provides a useful basis for the weighted ranking and may be valuable in the comparison and selection of plant sites considered.

The weighted ranking method

First step

~~Inputs in~~ restraint factors are again listed and weightage is give to them. Repeating the unweighted ranking example, it will look as follows:

Parameter	Weightage
Fixed investment in national currency	o,40
Fuel gas usage	o,25
Imported raw material costs	o,15
Electric power usage	o,10
Need for skilled labour	o,10
	1,oo

As can be seen, the most important criterion is the conservation o: foreign exchange - at least in the concept of the selector - followed by the use of fuel gas, imported raw materials costs, etc.

Second step

Now we use each rank of the unweighted rankings, devide each of them by the highest rank number of that parameter and multiply the result with the weightage assigned to that parameter:

$$\text{Weight} = \frac{\text{Rank of parameter in the comparison}}{\text{Highest rank number of that parameter in the comparison}} \times \text{Assigned parameter weightage}$$

Example: The weightage for fuel gas usage:

$$\text{Weight} = \frac{3}{5} \times 0{,}25 = 0{,}15$$

Third step

Now we calculate the weights obtained:

	Technology source				
Parameter	A	B	C	D	E
Investment in national currency	0,240	0,080	0,160	0,320	0,400
Imported raw materials	0,113	0,038	0,038	0,150	0,075
Fuel gas	0,200	0,150	0,250	0,100	0,050
Electric power	0,020	0,040	0,060	0,080	0,100
Skilled labour	0,067	0,067	0,033	0,100	0,100
Weighted cost	0,64	0,37	0,54	0,75	0,73
Ranking	3	1	2	5	4

The technology with the highest weighted cost is the most proficient in the use of scarce resources, and is the most proficient and preferred technology. In the above example, Technologies D and E are particularly proficient. Considering the overall cost parameters and the impact on scarce resources, it is Technology D that should be preferred, but its selection would reduce the economic advantages obtainable otherwise through the selection of Technologies C and A.

If the weightages, i.e. the priorities have been well selected and have to be preserved, the decision-makers will have to compromise, or "trade-off" certain advantages against others.

It is a general experience, that there is almost never a technology that could be found superior to others in each and every respect considered.

The ranking methods are useful when the weightage of critical parameters can be quantified on a rational basis.

The Points System Method

Here qualitative factors are taken into account, those figuring in checklists of Annexes 2. and 3., such as operational and public safety etc., which cannot be quantified or weighted.

For applying the Points System, the following steps are followed:

1. A workable list of all key evaluation parameters is prepared with "evaluation criteria" well defined.

2. A parameter the evaluator considers as the most significant one of all parameters - the REFERENCE PARAMETER - is given a weightage of 100.

3. The weightage of all other parameters is assessed by the evaluator considering their importance to the Reference Parameter /they will, by definition, be less than 100/. This, we get the POINTS SYSTEM SCALE.

4. Oneof the compared technologies is taken as the REFERENCE TECHNOLOGY. It can be any of the technologies considered.

5. The evaluator will establich the Points Score for this Reference Technology according to his evaluation criteria, by giving it the maximum number of points if it has the most favourable feature or a lower score if the feature is found wanting This establishes the "vertical scoring" component of the evaluation methodology.

6. With the Reference Technology thus scored, all other candidate technologies are compared to it and scored criterion by criterion. /Some technologies may get a total score higher than that of the Reference Technology/. This is the "horizontal scoring " component of the methodology.

/10

7. The points obtained for each of the competing technologies are totaled.

8. The technologies are ranked on the basis of such totals.

An example:

		Points Systems Scale	Technology source I Reference Technology	II	III	IV
A.	Product parameters:					
	Product purity /1/	1oo	8o	1oo	85	75
	Product range /2/					
B.	Input raw materials:					
	Raw material A /3/	3o	35	25	2o	4o
	Raw material B /4/	5o	6o	5o	4o	7o
C.	Consumption parameters:					
	Catalyst /5/	6o	1o	75	5o	2o
D.	Safety parameters:					
	Pressures /6/	3o	3o	3o	1o	1o
	Toxic chemicals /7/	85	7o	7o	4o	++
E.	Environment factors:					
	Refrigeration /8/	2o	3o	3o	2o	2o
	Effluents /9/	5o	7o	6o	1o	4o
F.	Implementation:					
	National construction firms /1o/	7o	4o	6o	3o	4o
G.	Technology absorption:					
	Time /11/	4o	4o	6o	4o	5o
		575	51o	595	4oo	4o5 +++

\+ - A higher scoring in the horizontal means that the technolog comes closer to meeting evaluatory criteria set for the parameter

++ - Data not available at time of analysis

+++ - Incomplete totals due to lack of data.

/Continued/ /-11

Evaluation criteria:

/1/ Should equal or approach export quality
/2/ Should be as wide as possible
/3/ A too rigid specification is undesirable
/4/ Delivered cost is important
/5/ Diversity of sources of supply desirable
/6/ High pressure process systems should be minimally used
/7/ Minimum use of declared toxic materials desirable
/8/ Fluorocarbon-based refrigeration systems should be as minimal as possible
/9/ Cost of waste treatment should not be an undue burden on the recipient
/1o/ Maximum feasibility of use desirable
/11/ Factory decision-making must be in control of the national enterprise within the shortest possible time, say, 24 months.

As can be seen, the evaluator has assigned the highest priority to "product purity" - most possibly with the objective to get access to export markets. This is the Reference Parameter. Following this are - in hierarchical order: the use /if any/ of declared toxic materials in the process; the feasibility of using national firms in the construction of the plant; etc.

Again it can be seen that none of these factors can be given a financial value or a weightage - at least not in a straight-forward manner.

Similarly, it can be observed, that Technology III obtains a higher ranking than the "Reference Technology". This may happen with this method.

<u>A warning</u>: An evaluator may assign too high a level of points to a relatively unimportant parameter to act as a compensator /through undue weightage on the Points Systems Scale/ for a serious deficiency in a critical area of technology performance, distorting thereby the assessment.

<u>Some remarks to the application of these methods</u>:

- Since different aspects of technology are evaluated in the methods shown, it is advised to use all three to arrive at the most appropriate technology among those offered.

- It should be aimed at to select the technology with a "low risk profile", while traing to obtain maximum possible "insurance" against risks being accepted, including the risk of an inappropriate technology.
- Process disclosure agreements, process warranties and guarant ies, involvement of the transferor as much as possible into as many phases of implementation as possible, buy-back arrang ments, joint-ventures, shared production, sub-contracting of parts of manufacturing etc. are available possibilities for increased sadety, in addition to those measures already suggested.
- All above methods have a substantial degree of subjectivity, both in respect of selecting criteria for ranking and in awarding scores.

  In order to reduce such subjectivity, it is advised to have two or more experts perform the assessment independently, and to apply statistical methods available in literature both for selection of criteria and for awarding of points or ranks. Such methods are the Spearman rank correlation coefficient test and the use of the coefficient of concordance test for statistical coherence.

Summary

Each and every transplantation of a technology from one environment into another bears risks both technologically and commercially. These risks may vary within a large scale according to the complexity of the technology, to the difference in the levels of the transferor and recipient companies, industries and countries. The greater are such differences, the greater are the risks.

In order to achieve a successful transfer, the most appropriate technology must be selected from among those available for transfe

Appropriateness means a technology that can be well absorbed, with nearly the same effectivity as in the source environment, at the lowest risk possible involved with the transplantation.

Successful transplantation also means that the transplanted techno

logy must have a stimulating effect on the environment of the host country, on maintenance, repair, training, development, research, education, transport, telecommunication etc. in the recipient country.

All these require a most thorough preparation of the project with a most thorough selection of the technology and its supplier.

Methods have been suggested for an assessment of technologies offered for appropriateness, that should be oriented not so much on the commercial or financial success of the transaction, but mor on the technological transfer itself - serving as a base for such success - its techbical features, the risks involved and their correlations with and effects on aspects of national scarcity factors and national priorities for development.

Such assessments involve much subjectivity that should be reduced as much as possible by using parallel assessments and statistical methods.

The completion of such assessment for appropriateness and risks level provides a good basis for commercial evaluation of the "valu of the technologies involved and the consideration to be paid for.

Annex 1.

IDEALISED TECHNOLOGY SELECTION PROCESS

The National Market Environment

Candidate Products for Manufacture
(STEP A)

Market Assessments
Product Identification
Market Size
(STEP B)

Potential Modes of Production
Investment Estimates
(STEP C)

Preferred Modes of Production
(Raw Materials, Energy Forms, Skills, Etc)
(STEP D)

Suitable Technological Routes
(STEP E)

Potential Technology Suppliers
(STEP F)

Select Alternate Technologies
And Respective Technology Sources
(STEP G)

Evaluation of Technology Attributes
(trademarks, patents, etc)
(STEP H)

Analysis of Appropriateness of Technologies
Analysis of Technology Risks
(STEP I)

(Contd.)

Preferred Form of Technology Transfer
(joint–venture, license, etc)
(STEP J)

Analysis of Financial Acceptability
(including technology costs)
(STEP K)

Preferred Technology and
form of acquisition
(STEP L)

Preferred Mode of Technology Implementation
(Turnkey, Unpackaged, etc)
(STEP M)

Preferred Strategies of
Market Entry and product
Establishment
(STEP N)

Enterprise Formation, **
Technology Transfer and
Project Implementation
(STEP O)

* – Italicised statements/steps relate to matters of technology evaluation

** – Aspects relating to enterprise structure, funding, etc are not detailed here, although some of them may have a bearing on technology selection

Annex 2.

CHECKLIST A: ILLUSTRATIVE CHECKLIST FOR ANALYZING APPROPRIATENESS OF AN 'OPEN- ARCHITECTURE' TYPE OF TECHNOLOGY

1. Is the technology supplier practicing his technology currently? Where, and for what levels of market? Does he have subsidiaries/licensees in other parts of the world? (in other words, is the technology amenable to different environments)

2. Can the technology supplier provide recipes for all of the grades of materials required in the market-place and does he have commercial experience in these grades? Are these recipes 'state-of-the-art'? Can they be modified to suit particular needs?

3. Is the general flow of operations consistent with the flowsheet and layout prepared by the technology-seeker or are there other special features? Is automation relevant?

4. What features/equipment can constrain production (which are the crucial equipment)? What key features determine the capacity of the plant? Will cooperation be possible for phased upgradation of capacity?

5. What features of the technology determine and limit product-mix?

6. Is quality-control complex? How complex (does it require complex equipment and special skills)? What features /tests/ inspections determine product-quality?

7. What features/equipment determine optimum production economics? Is scrap rate an important determinant of production economics? Can scrap be recycled? Is scrap resalable?

8. Which processing operations require a high level of skill in operations? Can the skill be developed on-site or requires observing/working experience at technology supplier's site?

9. If needed, will the technology supplier himself be in a position to provide detailed ordering information for critical equipment? - or will a third-party become involved?

10. Is customer technical service important? If so, can technology-supplier train national personnel?

11. Will the technology supplier provide assistance in trouble-shooting at manufacturing site? In the field?

12. What special contributions can the technology-supplier make towards the success of the

Annex 3.

CHECKLIST B ILLUSTRATIVE CHECKLIST FOR ANALYZING APPROPRIATENESS OF 'CLOSED-SYSTEM' TECHNOLOGIES

Project Features:

- basic outputs eg. product types and range in the context of national market requirements
- site suitability with regard to the application of the technology
- scope for project phasing

Product Specifications, Product-mix and Outputs:

- suitability of product in respect of prevailing national/international standards for product and suitability of (licensor) technology
- product specifications in relation to the 'positioning' and 'segmentation' of the product in the market-place
- product-mix capabilities of the technology; facets of product-adaptability;
- suggested current mix; ease of variation of output and change of product specifications
- product packaging requirements and design features (including 'esthetics')
- product quality determination standards
- consumer convenience features
- consumer safety profile of the product
- patent-related advantages (if product is patented and/or if competing with patented products)

Raw Materials:

- suitability of national raw materials; or specification of critical raw materials and minimum specifications
- variability possible in raw material specifications; ie. quality trade offs; possibilities of suitability determination through laboratory tests/ pilot-planting/ process simulation
- assurances of availability and supply of ancillary raw materials and products such as catalysts (which

are outside the control of the technology recipient)
- features of transportability - raw and auxiliary materials stability, hazards, containers, transportation modes, loading/unloading requirements, ware-housing

Energy Forms and Utilities:

- intensity of energy usage in the production system
- preferred energy forms and combinations - ie. steam, electric power, fuel oil, natural gas/LPG, etc
- other process/production utilities required - eg water, air
- desired features of utilities - pressures, temperatures, and means of obtaining them* [1]
- inter-suitability of energy forms and plant design in relation thereto

Plant and Equipment:

- use of high temperatures and pressures (operating safety factors)
- listing of critical equipment*
- responsibilities of national/international procurement
- tentative value ratio of imported/indigenous equipment
- hazards profile of the plant operations and safety design
- degree of automation
- operational simplicity and 'gold plating'
- equipment durability and life
- spare equipment/parts inventories required

Plant Design and Construction:

- single or multi-purpose facility
- modality of plant design and construction - 'turnkey' or 'disaggegrated construction' attributes
- layout of plant and machinery in conformity to national/ international regulations

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* [This type of information may not become available during early stages of technology exploration]

- role of technology supplier in design and layout of plant and machinery
- familiarity of licensor with respect to plant design and its layout; experience with procurement of equipment and services for installation of plant
- alternate need for the use of third-party engineering, construction, procurement firms
- technology-supplier's assistance for the identification of acceptable engineering, construction and inspection firms
- acceptable divisions of responsibility among negotiating parties in the use of engineering, construction and inspection firms and supervision/integration of the activities thereof

Skill Requirements:

- levels of skill (and number of personnel) required for start-up of plant, routine production, maintenance and quality control
- appropriateness of national skills; scope for supply of skilled personnel (licensor personnel) on licensee need basis
- modalities of upgrading national skill levels - on-site and supplier-site training

Quality-control/ quality-assurance features:*

- quality controls exercised on raw materials
- identified in-process products subjected to quality control*
- quality control on final products
- critical quality control equipment*
- investment in quality control equipment

Production Economics:*

- estimated minimum level of investment ('battery limits') and capacity
- scaling factors for 'upward' and 'downward' change in capacity (proportionate rise of investment and operating costs)

Annex 4. An example for the Comparative Costing Method

Basis:
Analysis of parametric data supplied by technology suppliers
Estimates are made at an operating capacity level considered commercially beneficial by all competing firms
Unit of currency : million $
Italicized costs are those based on data supplied by the technology proprietor or developed with his cooperation

	Technology Source				
	A	B	C	D	E
Annual Product Sales Value	13.5	13.5	13.5	13.5	13.5
1. Fixed investment:					
Foreign currency	4.1	3.6	3.3	6.0	2.9
National currency	6.0	7.4	6.4	5.9	5.6
Total	10.1	11.0	9.7	11.9	8.5
2. Raw and auxiliary materials:					
Local	0.6	0.6	0.4	0.9	0.7
Imported	1.4	1.8	1.8	1.3	1.7
Total	2.0	2.4	2.2	2.2	2.4
3. Utilities:					
Petroleum fuels	0.6	0.7	0.5	1.4	2.4
Electric power	2.2	1.8	1.2	0.7	0.5
Total	2.8	2.5	1.7	2.1	2.9
4. Labor:					
Semi-skilled	0.3	0.4	0.4	0.7	0.8
Skilled	0.4	0.4	0.5	0.2	0.2
Total	0.7	0.8	0.9	0.9	1.0
Operating cost(1-4)	5.5	5.7	4.8	5.2	6.3
5. Training costs (A)	0.9	0.7	0.6	0.7	0.7

6. *Maintenance costs (Contd)*	0.4	0.5	0.4	0.6	0.5
7. Plant and business overheads	3.0	3.0	3.0	3.0	3.0
8. Working Capital (Interest)	0.27	0.28	0.25	0.26	0.29
9. Depreciation (10 years)	1.01	1.10	0.97	1.19	0.85
10. Technology cost(B,C,D)	0.18	0.34	0.50	0.20	0.73
11. Annual Production Cost (incl. depr. + int.)	11.25	11.62	10.52	11.15	12.37
12. Profit before Tax (PBT)	2.25	1.88	2.98	2.35	1.13
13. PBT/Net Fixed Investment,%	22.4	17.1	30.7	19.7	13.4

(B): Technology cost

	Technology Proprietor				
	A	B	C	D	E
Technology fee (million $):					
(a) Flat fee	0.90	0.15	-	1.20	0.10
(b) No. of installments	1	1	-	3 (D)	1
(c) Sales royalty rate, %	-	3	7.5	-	6
(d) Royalty period, years	-	5	3	-	6
Technology Cost (E)	0.90	1.69	2.52	1.00	3.63

* - payable at the beginning of the first, third and fifth years

Note A: On-site + overseas training costs
Note C: Technology cost distributed over 5 years
Note D: Payable at the beginning of the 1st,3rd and 5th years
Note E: See Appendix A for basis of calculation