METHODOLOGY FOR THE PREPARATION AND PRELIMINARY EVALUATION OF TECHNOLOGY TRANSFER PROJECTS

ICTP - Trieste, 10th February 2005

TECHNOLOGY TRANSFER

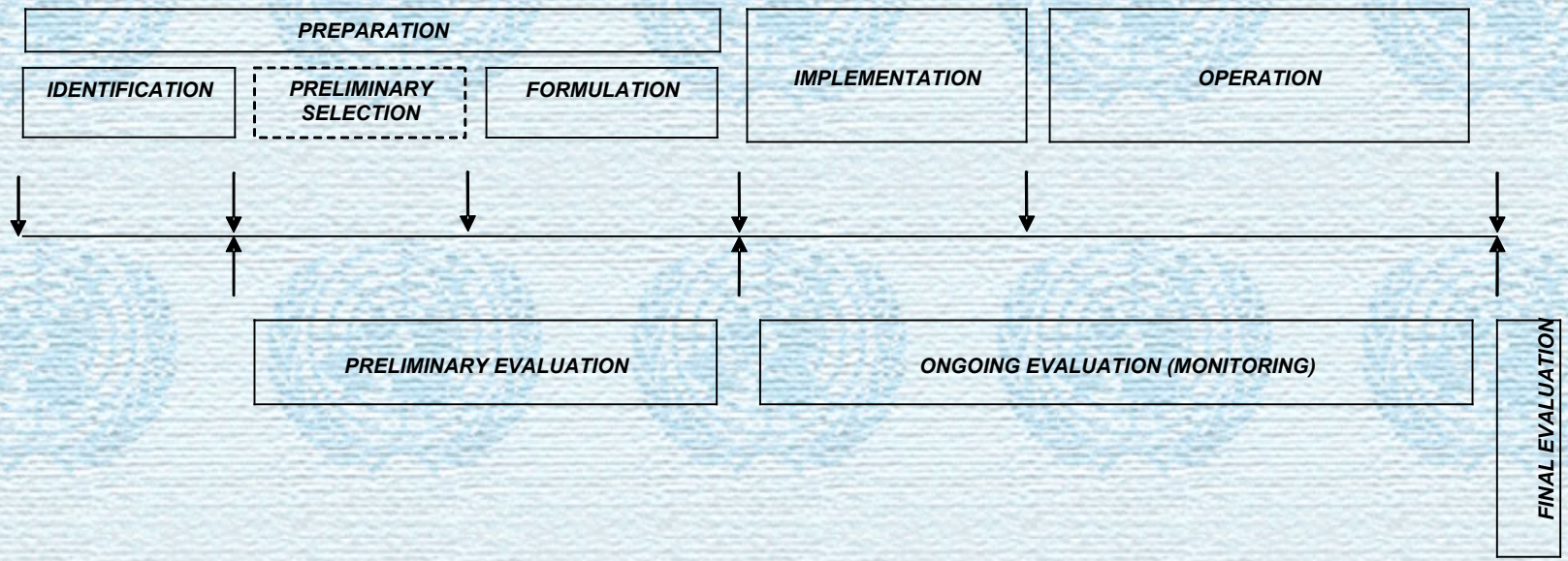
The "transfer" of technology is the transmission of know-how or product to partner private or public institutions and organizations and its adaptation to, and use in, their own cultural and socio-economic environment.

Technology transfer projects include both "soft" and "hard" elements of technology and may involve acquisition of technology, demonstration of use, dissemination of information, training and other means that lead to innovation.

Technology transfer is an active term, which is effected by interaction between technology sponsors and potential users.

PROJECT CYCLE

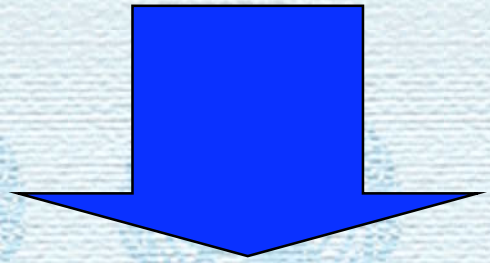
Project cycle
is an integrated process of **4** interrelated stages:
preparation, evaluation, implementation and operation



IDENTIFICATION

The **project idea** may arise from country studies, sectoral studies, market studies, expert group meetings, conferences, development plans, scientific or technical studies, etc.

NEED IDENTIFICATION



DEFINITION OF PROJECT OBJECTIVES AND STRATEGY

PRELIMINARY SELECTION

Project development, which consists in translating an idea into an operating project, is a costly and time-consuming task and requires adequate funding. Therefore, before assigning larger funds, a further assessment of the project idea, or the alternative project ideas, should be done.

A **pre-feasibility study** should be viewed as an intermediate stage between a project idea and a detailed project formulation, the difference being in the degree of detail of the information obtained and the intensity with which project alternatives are discussed and evaluated.

If the pre-feasibility study indicates that a project idea appears to be a promising one, the decision may be taken to proceed further with the detailed formulation of the project (feasibility study)

FORMULATION

The **feasibility study** is the main document in the formulation of a project and it should contain all technical and economic data that are essential for the evaluation of the project.

The criteria for the evaluation must be derived from the different project's objectives and the priority assigned to each criteria must correspond to the importance of the respective objective.

The feasibility study is a flexible tool to analyze from the technical, economic, financial and managerial point of view all the alternative ways of accomplishing the objectives of the project idea, and to present the findings and supporting data in a systematic and logic order.

FORMULATION

The structure of a feasibility study should be the same as that of a pre-feasibility study and should reflect, according to the project's objectives, the following aspects:

1. Executive summary
2. Project background
3. Output analysis
4. Inputs and supplies
5. Location, site and environment
6. Engineering and technology
7. Overhead costs
8. Human resources and training requirements
9. Implementation planning and budgeting
10. Financial analysis

1. Executive Summary

For convenience of presentation, the feasibility study should begin with a brief executive summary outlining:

- Terms of reference and methodology of the study
- Composition of the team in charge of the study
- Structure of the study
- Conclusions and recommendations

2. Project Background

- Project history
- Description of the project idea (objectives and strategy)
- Identification of the project's sponsors and their role
- Analysis of the social, economic, financial, industrial and political context
- Identification and evaluation of possible similar initiatives

3. Output Analysis

Consists of the definition of the present and future actual demand or need for the outputs of the project and of the corresponding characteristics and specifications.

Key activity to determine:

- scope of the project
- best technological solution and derived requirements
- choice of a location/site
- implementation/operation programme

3. Output Analysis

The output analysis must be carefully structured and planned starting from the project idea and utilizing the necessary research instruments. The depth or degree of detail of the analysis should be determined according to the complexity of each problem and its importance for the project or the project evaluation.

There are basically two options for obtaining the required data, and in most cases both options are combined:

a) **Desk research** (overall quantitative estimates)
b) **Field survey** (detailed qualitative and quantitative estimates)

No field survey should be undertaken before the full potential of desk research has been exhausted!

3. Output Analysis

PROJECT IDEA

(objectives and strategy)

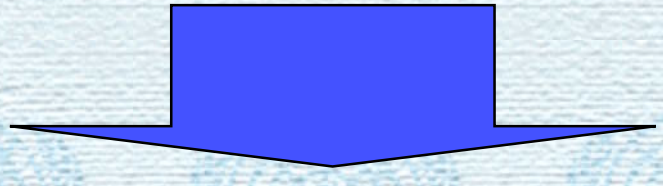
OUTPUT ANALYSIS

(need/demand)

3. Output Analysis

DATA ASSESSMENT

(desk research + field survey)



DEFINITION OF THE TARGET BENEFICIARY GROUPS

(composition, size, behavior, expectations, etc.)

DEFINITION OF THE PROJECT OUTPUTS

(scope, quality, design, standards, etc.).

ESTIMATE OF THE ACTUAL OUTPUT DEMAND/NEED

(present and future)

4. Inputs and Supplies

Description and analysis of the different materials, utilities and inputs required for the implementation and operation of the project as well as their availability and supply.

A detailed assessment of the inputs required can only be made after the analysis and selection of site and technology!

Estimates of annual costs for such inputs and supplies are to be made. The price basis for the estimates (price level, quotations from suppliers, world market price, comparisons with similar inputs in other projects etc.) should be stated in order to enable the reader to check their reliability.

5. Location, Site and Environment

Location and site are often used synonymously but must be distinguished.

The choice of location should be made from a fairly wide geographical area, within which several alternative sites can be considered.

The main criteria or key requirements for selecting proper locations and sites should always be identified at an early stage of the study.

The analysis of these key requirements would than allow the assessment of a number of potential locations and sites, and the rejection of those not fulfilling the key requirements.

Some sites may require substantial work on **site preparation and development**, and the related costs should be adequately estimated.

5. Location, Site and Environment

The criteria and requirements for the **location analysis** may be classified as follows:

- Natural environmental, geophysical conditions and requirements
- Socio-economic policies, incentives and restrictions and government plans and policies
- Infrastructural services (conditions and requirements)
- Economic and social infrastructure (institutional framework, economic activities, urbanization, literacy, etc.)
- Availability of critical project inputs (materials and supplies)
- Organizational and human resources requirements

5. Location, Site and Environment

Once the location is decided upon, a specific project site and, if available, site alternatives should be defined. The structure of the **site analysis** is basically the same as for locations analysis, and the criteria and key requirements may be the followings:

- Conditions on site (topography, climate, etc.)
- Local infrastructure (buildings, technical installations and facilities, access to water, electric power, roads and railways or water transport.)
- Availability of critical project inputs (labor and factory supplies)
- Cost of land
- Site preparation and development (requirements and costs)
- Environmental impact (restrictions, standards, guidelines)
- Socio-economic conditions (restrictions, incentives, etc.)

5. Location, Site and Environment

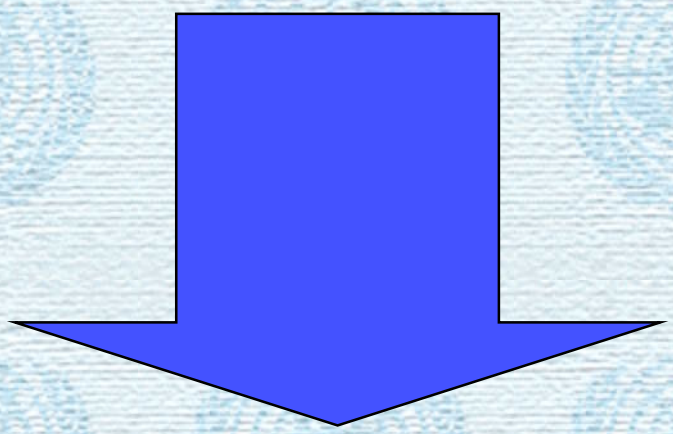
The feasibility study should include a through and realistic analysis of the environmental impact of the project.

The general objective of **environmental impact assessment** is to ensure that the effects of the project over its projected life do not unacceptably degrade the environment, and that no residual effects are anticipated that would contribute to long-term environmental deterioration.

In principle, environmental impacts should be assessed on the basis of legal regulations and emission standards and guidelines established in the country where the project is located but also at the international level.

6. Engineering and Technology

1. Selection of the appropriate technology and know-how



2. Planning of the acquisition of the technology and know-how

TECHNOLOGY EVALUATION AND SELECTION

a) Assessment of the criteria for the selection of the technology required, on the basis of critical elements such as:
   - project strategy and objectives
   - socio-economic and legal conditions
   - environmental conditions

b) Identification of the available and emerging technologies responding to the criteria of selection

c) Evaluation of the alternative technologies in terms of:
   - Technical efficiency
   - Suitability and Adaptability
   - Costs and Availability

d) Choice of the most appropriate technology

e) Project design and basic engineering (charts and drawings)

f) Identification of the machinery and equipment required

TECHNOLOGY ACQUISITION AND TRANSFER

a) Assessment of the alternative sources of supply of the selected technology (market analysis)

b) Evaluation of the Intellectual Property Rights (if applicable)

c) Choice of the mean of acquisition (licensing, outright purchase, joint venture, etc.) and definition of the contractual terms and conditions

d) Estimate of the initial investment and operation costs for technology and know-how, including:
   - machinery and equipment
   - installation and commissioning
   - maintenance
   - spare parts
   - training and technical assistance
   - IP fees and royalties

7. Overheads

Overheads are all the cost items not directly related to specific project activities for the output production, but anyway necessary for the project operations. They include:

- **Project overheads** (office supplies, communications, rents, insurance, taxes on property, administrative fees, etc.)
- **Depreciation costs** (accounting method to distribute the initial investment costs over a period of time determined by law)
- **Financial costs** (interests on loans)

Estimates of annual costs for such overheads are to be made.

8. Human Resources and Training

The implementation and operation of a project needs different categories of human resources with sufficient skills and experience.

- Definition of the HR requirements distributed for different job profiles (manning table)
- Assessment of the availability of personnel
- Definition of the training needs
- Preparation of the training programme (formal and on-the-job)
- Estimate of the labor and training costs

9. Implementation Planning and Budgeting

- Determination of the type of work tasks on- and off-site, that are necessary to implement the project
- Determination of the logical sequence of events in the work tasks
- Preparation of a time-phased implementation schedule
- Determination of the resources needed to complete the individual tasks and estimate of the corresponding costs
- Preparation of an implementation budget and cash flow that will ensure the availability of adequate funds throughout the implementation phase (including initial investment costs)

Overlapping and simultaneous planning is inevitable!

9. Implementation Planning and Budgeting

The main stages of project implementation planning do not always lend themselves to a stage-by-stage analysis with one stage invariably leading to the other. A great deal of overlapping and simultaneous planning of various activities is inevitable.

Appointment of the implementation team
Legal process, registration and authorization
Governmental approvals
Financial planning (credit opening)
Organizational build-up and personnel recruitment
Technology acquisition and transfer
Detailed engineering
Tendering negotiation and award of contracts
Acquisition of land construction and installation
Site preparation
Supply of materials and services
Commissioning
Etc.

10. Financial Analysis

To ensure adequate funding during the entire project cycle (financial coverage or sustainability) it is necessary to check and systematize all cost items previously estimated (**cost analysis**) and to prepare, on consequence, the related **financial planning** considering the different sources of funds.

COST ANALYSIS

Initial Investment Costs **vs.** **Operation Costs**

10. Financial Analysis

INITIAL INVESTMENT COSTS

FIXED ASSETTS

=

FIXED INVESTMENT COSTS

+

PRE-OPERATION EXPENDITURES

NET WORKING CAPITAL

FIXED INVESTMENT COSTS include:
- **Land purchase**
- **Site preparation**
- **Building and civil works**
- **Machinery and equipment**
- **Lump-sums for patents and know-how**

PRE-OPERATION EXPENDITURES include:
- **Administrative and legal fees**
- **Consultant fees**
- **Salaries for personnel during the implementation**
- **Travel expenses**
- **Training costs**
- **Interests on loans during the implementation**
- **Insurance costs during the implementation**
- **Trial runs, start-up and commissioning**

NET WORKING CAPITAL =
Current assets (inventories, accounts receivable and cash) – Current liabilities (accounts payable)

10. Financial Analysis

OPERATION COSTS

Operation costs should be calculated as total annual costs (if the financial coverage is on yearly basis) starting from the first year of operation of the project and should include:

- costs for inputs and supplies
- royalties for use of technology
- overhead costs
- labor costs (including on-the-job training)

10. Financial Analysis

PROJECT FINANCING

The cost analysis is essential to determine the scope of the **financial requirements** to implement and operate the project, and eventually to search for adequate external funding (grants and loans). The final objective is to ensure that the project is financially sustainable during the entire development cycle.

SOURCES OF FUNDING:

- Internal resources (cash and in-kind)
- Project revenues
- Grants
- Loans

Unless the funding resources are sufficient to meet the financial requirements it is not prudent to proceed to the project implementation!

10. Financial Analysis

ECONOMIC EVALUATION

A technology transfer project should also be justified within the wider context of the national economic and social environment. For that reason, and in order to allow the determination of public funding, the net benefits generated from the national and socio-economic point of view should be determined.

The economic evaluation of the projects may be characterized as follows:

- Project inputs and outputs are valued at shadow prices that reflect their value to the national economy;
- Direct effects on the economy as well as indirect effects are included in the analysis where significant (these effects may be economic benefits or costs, both tangible and intangible);
- Social and environmental impact are accounted for.

10. Financial Analysis

The detailed assessment of the different aspects systematically presented in the feasibility study should allow decision makers to make a **definitive choice** regarding the implementation of the project, on the basis of criteria of selection previously established and strictly dependent on the nature of the project.

In case the response is positive, the feasibility study will constitute the main reference document to proceed with the project implementation.

CONTACTS

Vincenzo Pianese
Project Evaluation and Management

ICS-UNIDO
AREA Science Park - Padriciano
34012 Trieste (Italy)
Tel. +39-040-9228123
Fax: +39-040-9228122
vincenzo.pianese@ics.trieste.it
www.ics.trieste.it