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the respondent. It also depends on the randomness of the sample selected. Considering the high degree of non-response and false information, an initially random sample may result in information that is far from being representative and reliable. But surveys, by and large, yield statistics that are far more reliable than data from existing documentation.

CONCLUSION

In the light of Nigeria's weak statistical base, only simple techniques of demand forecasting can at the moment be used. The Research Department of NIDB usually makes use of simple regression techniques for trend fitting and extrapolation to determine the supply gap. Nigeria has not yet reached a stage where advanced econometric models can be employed for demand estimation. A recent attempt by my Department to forecast the demand for wheat flour by multiple regression ended in futility when the matrix determinant turned out to be zero owing to linear dependence among the variables involved.

G. K. Ajayi
NIDB Research Department
13th October, 1983
ANNEX 5: Test for UNIDO Training Course:
18 questions to be answered by the participants of the seminar
1. What is the difference between NPV and IRR, and indicate how you could estimate the IRR graphically? (Label all lines.)

2. Indicate the three types of debt repayment schemes used, and describe the difference between them?

3. What is a 'grace period; and when is it appropriate?

4. To calculate the Current Ratio, what 'entries' must you use?

5. What cost factors are considered in calculating 'working capital'? Give an example of how it might be done.

6. What 'costs' are included in the UNIDO definition of: Production Cost? Factory Cost? Operating Cost?

7. What do you need to know about costs to construct a 'break-even' chart? Construct one, and label all lines.

8. What kind of information do you need to know in order to prepare a manpower requirements table and the Estimate of production costs?

9. What is meant by 'project life' and 'plant life' and how may they differ? Where is each appropriate to be used?

10. Describe 'inventory costing' by LIFO and FIFO methods? Which one would maximize the annual profit? Overstate inventory?

11. What does it mean that 'inventory turnover' is 7 times? How was this calculated?

12. What does it mean if 'collections' are running 90 days? How was this calculated?

13. What kind of information would you need to know to determine if a prospective project had a market? How would you treat the data (Methods of statistical analysis)

14. How would you handle the costs for land - if they are a lump sum - if they are an annual rental? How would you depreciate them?
15. Describe how the normal demand (optimal allocation) is influenced by subsidies? Indicate this effect graphically.

16. Describe the mechanism of demand/supply of foreign exchange works to 'self-regulate' in an economy with no artificial trade or monetary barriers?

17. What is the 'shadow wage rate' in the 'Little-Mirrlees' Method, what are its components, and how is it calculated?

18. A loan of Naira 1 million at 14% for 15 years, 3 years 'grace' is given to a project. Calculate annual payment by 'annuity' method? What is the interest payment in the first and last years of the loan? (Note: Drawdowns: 1st yr=N250,000; 2nd yr=N500,000; 3rd yr=N250,000.)
ANNEX 6: Teaching Materials and Outlines for Slides, Module I: Outline of the Project Development Cycle
TEACHING MATERIALS AND OUTLINES FOR SLIDES

COURSE OUTLINE:
The Project Cycle
Refer Section: 1
Module: 1
INDUSTRIAL PROJECT PREPARATION
FINANCIAL AND COST-BENEFIT AND
TECHNICAL ANALYSIS/EVALUATION

COURSE ORIENTATION

WHAT IS PROJECT PREPARATION AND PLANNING?

WHAT TO PRODUCE?

HOW TO PRODUCE IT?

HOW MUCH TO PRODUCE?

WHERE TO PRODUCE IT?

HOW TO DISTRIBUTE AND SELL THE PRODUCTION?

HOW TO FINANCE?

HOW TO MANAGE THE PROJECT?

ALTERNATIVES TO BE EXAMINED FOR DECISIONS:

MARKET SEGMENT

TECHNOLOGY

SIZE OF FACILITY

LOCATION/SITE

MARKETING IMPLEMENTATION PROGRAM

METHODS OF FINANCING

ORGANIZATIONAL STRUCTURE

ADDITIONAL FACTORS:

RAW MATERIAL AVAILABILITY

ECONOMICS OF CAPITAL ALLOCATION

DEVELOPMENT PRIORITIES

SOCIAL BENEFITS FROM BOTH PRODUCTION AND THE PRODUCTION PROCESS
OBJECTIVES:

WHAT IS A 'FEASIBILITY STUDY'? 
WHY ARE FEASIBILITY STUDIES MADE? 
WHEN AND WHAT KIND OF STUDIES SHOULD BE UNDERTAKEN?

THE PHASES OF AN INDUSTRIAL DEVELOPMENT PROJECT:

PRE-INVESTMENT PHASE

PROJECT IDENTIFICATION - 'PROFILES'
PROJECT 'OPPORTUNITY' STUDIES.

BY: AREA or REGION
SUBSECTOR of the ECONOMY
RESOURCES AVAILABLE
INTERLINKAGES WITH OTHER PROJECTS

SPECIFIC PROJECT INVESTMENT STUDIES

ALTERNATIVE METHODS & TECHNOLOGIES
COST IDENTIFICATION & LIMITATIONS
SPECIFICATION OF CONSTRAINTS

PRE-FEASIBILITY STUDIES:

INTERMEDIATE STAGE - LESS FULLY DEVELOPED THAN 'FEASIBILITY' STUDY
LESS COSTLY

PRE-SELECTION PROCESS/ALLOCATION OF RESOURCES
TRANSFORMATION INTO AN INVESTMENT PROPOSAL
THE PHASES OF AN INDUSTRIAL DEVELOPMENT PROJECT:

SUPPORT STUDIES:

MARKET RESEARCH AND ANALYSIS:

RAW MATERIAL AND INPUT STUDIES:
  PRICES/PRICE TRENDS (Economic)
  LABORATORY STUDIES/TESTS (Technical)

LOCATION STUDIES:
  UTILITY AVAILABILITY (WATER, ELECTRICITY)
  TRANSPORT COSTS
  ORIENTATION TOWARDS RAW MATERIAL OR MARKETS
  AVAILABILITY OF MANPOWER

TECHNICAL STUDIES / ECONOMIES OF SCALE
  ALTERNATIVE PROCESSES/PLANT SIZES
  PILOT PLANT OPERATION TO PROVE THE TECHNOLOGY

EQUIPMENT STUDIES:
  EQUIPMENT - IDENTIFICATION OF POTENTIAL SUPPLIERS
  CHOICES ON DEGREE OF MECHANIZATION OR INTENSIFICATION OF MANUAL OPERATIONS
  SPECIFICATIONS FOR SUCCESSFUL BIDDING

THESE ARE UNDERTAKEN TO SUPPORT THE 'PRE-FEASIBILITY' OR 'FEASIBILITY' STUDY

THEY MAY BE EXPANDED TO CLEAR-UP QUESTIONS

IN RELATION TO THE COMPLEXITY OF A 'FEASIBILITY STUDY'

THEY ARE:
  - SINGLE SUBJECT FOCUSED
  - MAY INVOLVE VERY SPECIALIZED SKILLS
  - ASSIST IN THE PROJECT SELECTION PROCESS

THE FEASIBILITY STUDY:

MUST PROVIDE ALL THE INFORMATION:
  - TECHNICAL SPECIFICATIONS
  - COMMERCIAL/MARKET
  - FINANCIAL/VIABILITY/ABILITY TO GET CREDITS
  - ECONOMIC/COST-BENEFIT IN TERMS OF COLLECTIVITY

MUST INDICATE POSSIBLE ALTERNATIVES

MUST DEFINE PROJECT SCOPE/SIZE ETC.

SHOULD CONTAIN DRAWINGS, TABLES ETC.
THE PHASES OF AN INDUSTRIAL DEVELOPMENT PROJECT:

THE FEASIBILITY STUDY (continued)

COMBINES RESULTS OF:

MARKET RESEARCH
RAW MATERIAL INPUTS
LOCATION
TECHNICAL EQUIPMENT ........ STUDIES

LEADS TO A DEFINITIVE INVESTMENT DECISION

EVALUATION AND DECISION STAGES:

EVALUATION REPORT

TECHNICAL EVALUATION
FINANCIAL EVALUATION - Commercial Profitability
ECONOMIC EVALUATION - Cost/Benefit Analysis -
National Economic Profitability

FIVE PARAMETERS:

 Aggregate Consumption
 Income Distribution
 Growth Rates of National Income
 Employment Objectives
 Self-Reliance and Merit Wants

INVESTMENT STAGE:

NEGOTIATION and CONTRACTING
FINAL PROJECT DESIGN
CONSTRUCTION
START-UP and COMMISSIONING

OPERATIONAL PHASE:

EX-POST EVALUATION STAGE:

IMPORTANCE IN CASES OF PROJECT PROBLEMS
CERTAINLY IN CASES OF PROJECT FAILURES
NECESSARY IN CASES OF PROJECT ORIENTATION CHANGES FOR POLITICAL or OTHER REASONS
THE PHASES OF AN INDUSTRIAL DEVELOPMENT PROJECT:

THE PROJECT CHOICE:

THE OPPORTUNITY STUDY:

THE CONCEPT OF ECONOMIC ADVANTAGE
IN TRADE AND DEVELOPMENT

PRIORITIZING THE PROJECT SELECTION:

PRESENT CONSUMPTION PATTERNS and 'IMPORT SUBSTITUTION'

RAW MATERIAL PROCESSING and 'ECONOMIC INTEGRATION'

EXPORT PROMOTION and REGIONAL ECONOMIC INTERDEPENDENCE

THE FIVE COST/BENEFIT PARAMETERS
'MERIT TANTS' AND POLITICAL DETERMINATION

ECONOMIC CRITERIA:

AVAILABILITY OF MARKETS
AVAILABILITY OF RAW MATERIALS
AVAILABILITY OF APPROPRIATE TECHNOLOGY
AVAILABILITY OF MANPOWER AND SKILLS
PROJECT IMPLEMENTATION CAPABILITY
TRAINING POSSIBILITIES AND FACILITIES
TECHNOLOGY TRANSFER AND DEVELOPMENT
AVAILABILITY OF NECESSARY INFRASTRUCTURE
WATER, POWER, FUELS
AVAILABILITY OF CAPITAL or CREDITS

POLICY OBJECTIVES:

ALLOCATION OF CAPITAL AS A 'SCARCE'
SELF-SUFFICIENCY WITH REGARD TO BASIC NEEDS
INDUSTRIALIZATION
PROCESSING INTEGRATION AND LINKAGES
REGIONAL TRADE DEVELOPMENT
FOREIGN EXCHANGE GENERATION OR SAVINGS
INDEPENDENCE FROM EXTERNALLY CAUSED CYCICALITIES
PRODUCT DIVERSIFICATION and MARKET DEVELOPMENT
TAKE ADVANTAGE OF ECONOMIES OF SCALE
TEACHING MATERIALS AND OUTLINES FOR SLIDES

NATIONAL, SECTORAL and PROJECT PLANNING

Refer Section: 3
Module: 1
THE NATIONAL PRIORITIES: ALLOCATION OF RESOURCES

I. IMPROVE STANDARD OF LIVING OF POPULACE
   (Cost-Benefit Analysis--AGGREGATE CONSUMPTION OBJECTIVE)

II. DEVELOPMENT OF:
    AGRICULTURE
    INDUSTRY
    IMPORT SUBSTITUTION
    EXPORT GENERATION

III. EMPLOYMENT GENERATION

IV. PROVISION OF SOCIAL SERVICES
    ('Merit Wants')

FOCUS OF THE COURSE: INDUSTRIAL SUB-SECTOR

A. MAXIMUM UTILIZATION OF AGRICULTURAL AND MINERAL RESOURCES

B. MAXIMIZE 'VALUE ADDED' THROUGH:
   AVAILABILITY OF MARKETS FOR PRODUCTS
   AVAILABILITY OF RAW MATERIAL INPUTS
   DEVELOP SKILLS IN SECURING APPROPRIATE TECHNOLOGY
   AVAILABILITY OF MANPOWER AND SKILLS TRAINING
   ACCESS TO CAPITAL FOR INVESTMENT
      -- INCLUDING METHODS OF FOREIGN FINANCING
   PROCUREMENT OF NECESSARY INPUTS ON ADVANTAGEOUS TERMS

THESE GOALS WERE ENUMERATED BY THE HONORABLE
MINISTER OF INDUSTRIES IN HIS OPENING ADDRESS

Lagos, 5 September 1983
TEACHING MATERIALS AND OUTLINES FOR SLIDES

INDUSTRIAL POLICIES AND STRATEGIES

Refer Section: 6
Module: 1
POLICY INSTRUMENTS:

PROMOTION OF:

IMPORT SUBSTITUTION:
- TARIFFS
- QUOTAS
- LICENSING
- ARTIFICIAL EXCHANGE RATES

EXPORT PROMOTION:
- SUBSIDIES
- TAX EXEMPTIONS/DRAWBACKS
- EXCHANGE RATE ADVANTAGES

EMPLOYMENT:
- WAGE LEVELS
- TAX EXEMPTIONS
- FRINGE BENEFIT FORGIVENESS
- TRADE UNION PRESSURES

LOCATION:
- LOCAL TAX DIFFERENTIATION
- CHANGES IN INVESTMENT INCENTIVE PACKAGES
- PUBLIC INVESTMENT IN NEEDED INFRASTRUCTURE
- LAND AVAILABILITY AND PRICES

CAPITAL ACCUMULATION AND PRIVATE SAVINGS:
- TAXES ON CONSUMPTION;
  - SALES TAXES
  - TURN-OVER TAXES
  - INCOME TAXES AND SPECIAL EXEMPTIONS

GENERAL INVESTMENT INCENTIVES:
- CREDIT FACILITIES
- SUBSIDIZED INTEREST RATES
- CAPITAL REPATRIATION AGREEMENTS
- TAX HOLIDAYS
- EXEMPTIONS FROM LOCAL OWNERSHIP REQUIREMENTS
- ACCELERATED WRITE-OFFS
- DIVIDEND REPATRIATION ALLOWANCES

GENERAL INVESTMENT DISINCENTIVES:
- HIGH INFLATION RATES
- REVALUATIONS AND 'FREEZING' OF ASSETS AND DEPOSITS
- UNCONVERTIBILITY OF CAPITAL AND DIVIDEND REPATRIATION
- UNREALISTIC LOCAL OWNERSHIP REQUIREMENTS IN FACE OF LOCAL CAPITAL AVAILABILITY
- HIGH RATES OF INTEREST WHICH REFLECT RISK ASSESSMENT PRICE CONTROLS
TEACHING MATERIALS AND OUTLINES FOR SLIDES

PROJECT IDENTIFICATION:

Refer Section: 7
Module: 1
PROJECT IDENTIFICATION

APPROACH IN ONE OF TWO WAYS:

I. 'TOP DOWN'

PROJECTS DERIVED FROM COUNTRIES POLICIES AND STRATEGIES:

RESULT:

PROJECTS ARE COMPATIBLE WITH THE LONG-TERM PLANS

PROJECTS MAY HAVE MICRO-ECONOMIC DEFICIENCIES

II. 'BOTTOM DOWN'

PROJECTS DERIVED FROM 'GRASS ROOTS'

IE: MICRO-ECONOMIC CONSIDERATIONS

'THE MARKET ECONOMY' APPROACH

RESULT:

PROJECTS USUALLY FINANCIALLY AND COMMERCIALLY SOUND

PROJECTS MAY DIFFER FROM POLICIES AND STRATEGIES OF THE GOVERNMENT

PROJECTS MAY FAIL COST-BENEFIT TESTS OF ECONOMIC AND SOCIAL VALUE CONTRIBUTION

DEPENDENT UPON STRESS GIVEN TO CRITERIA

QUESTION ?? IS THE 'FREE MARKET' APPROACH INCOHERANT WITH PROGRAMS FOR DEVELOPMENT ?

WHAT ARE THE OBSERVED RESULTS IN THE CENTRALLY PLANNED ECONOMIES ? WHAT SHOULD NIGERIA DO ?
ANNEX 7: Teaching Materials and Outlines for Slides,
Module II: Market Analysis
Market & Fin. Analysis
Lagos, Nigeria Course
5 Sept - 14 Oct 1983
Materials used by
Mark Weber

TEACHING
MATERIALS
AND
OUTLINES
FOR
SLIDES

MARKET RESEARCH

Refer Section: 3
Module: II
MARKET RESEARCH
Orientation

IDENTIFY the PRODUCT - (Specifications)

" " QUANTITY - Domestic Demand
- Potential for Export

" " PRICE - Supply/Demand Relationship
- Elasticity'

" " MARKET - Characteristics of Consumer
- Methods of Consumption
- Character and Restraints of
- Distribution Channels

HOW MARKET RESEARCH IS CARRIED OUT :

ANALYSIS - Past and Present DEMAND Data

'Purifying' the DEMAND TREND by.
Fragmenting/Segmenting MARKET
Separating EFFECTS of PRICE CHANGES

(Note: CONSUMPTION is Not Always
Equal to DEMAND. Why?)

DATA REQUIREMENTS:

WHAT is needed?
WHERE can it be found?

STATISTICS: DOMESTIC MARKET : AREA SERVED etc.
LOCAL PRODUCTION PLUS IMPORTS

'SMUGGLING'/MARKET DIFFERENTIATION
LIMITATIONS of DATA GROUPINGS/BREAKDOWN
SEARCH for RELATED DEMANDS WHICH ARE KNOWN
or CAN BE INDEPENDENTLY ESTIMATED

PRICE DATA: IMPORTS - F.O.B. / C.I.F.
(Free on Board; Cost Insurance & Freight)
PRICE STRUCTURE: Breakdown; ex-factory,
Middle-men commissions, retail mark-up

DISTRIBUTION REQUIREMENTS: Stocks, freight
containers, packaging, returns, product
warrenties and guarantees, (aging, etc.)

OTHER DATA SOURCES:
FAMILY BUDGET SURVEYS/MARKET BASKET
IMPORT DUTIES/SALES TAX COLLECTIONS

QUALITATIVE DATA:

CONSUMER ATTITUDES
DEGREE of COMPETITION in MARKET
GOVERNMENT REGULATIONS: HEALTH
- LICENSING; SUBSIDIES etc.
MARCET RESEARCH
Orientation (2)

How MARKET RESEARCH IS CARRIED OUT:

STATISTICS: EXPORT MARKET: AREA SERVED etc.
IMPORT STATISTICS IN PROSPECTIVE MARKETS/AVAILABILITY
IMPORTANCE OF FREIGHT
POSSIBILITIES OF TRANSPORT AND ECONOMICS
GOVERNMENT REGULATIONS AND LICENSING/QUOTAS/
IMPORT DUTIES/EXPORT 'DRAWBACK ON TAXES ??
OTHER INCENTIVES TO ENCOURAGE EXPORTS
DEGREE OF COMPETITION IN PROSPECTIVE MARKETS: TRADITIONAL
TRADING PARTNERS: CAPTIVE SUBSIDIARIES etc.
METHODS OF DISTRIBUTION/AGENTS; FEES; PROMOTION METHODS
FINANCING OF STOCKS; PROBLEMS OF WARRANTIES & GUARANTEES
PRODUCT RETURNS etc.
PRICE DATA: F.O.B./C.I.F.
PRICE STRUCTURE: Breakdown; costs of transport; mark-ups
DISTRIBUTION REQUIREMENTS: containers, packaging, quantities
quality determinants, etc.

SOURCES OF INFORMATION:

PUBLISHED DATA: Actual, ESTIMATES
OFFICIAL: GOVERNMENT; BANKS; TRADE ORGANIZATIONS
UNPUBLISHED DATA: PRESENT IMPORTERS
PRIVATE ENTREPRENEURS/POTENTIAL PARTNERS
SURVEYS; INTERVIEWS etc.

EXAMPLES:

DOMESTIC MARKET:

MINISTRIES; CENTRAL BANK ANNUAL REPORTS
CUSTOMS DATA; TRADE PROMOTION AGENCIES
FIVE YEAR PLAN; GOVERNMENTAL BUDGETS

EXPORT MARKET:

INTERNATIONAL ORGANIZATIONS:

I.M.F.
WORLD BANK
UNCTAD/ITC
UNIDO
FAO/IL0
O.E.C.D.
E.C.A. (Economic Commission for Africa
B.A.D. (African Development Bank)
ECOWAS Secretariat
International Federations and
Associations
Equipment Suppliers
MARKET RESEARCH
Orientation (3)

DEMAND FORECASTING:
UNCERTAINTY
POTENTIAL INFLUENCE OF UNFORSEEN EVENTS

USE OF MATHEMATICAL TECHNIQUES:
TIME SERIES
FITTING A TREND LINE
REGRESSION; CORRELATION OF DATA
TYPES OF TRENDS: STRAIGHT LINE
    COMPOUNDING/EXPONENTIAL
    SEASONAL
    CYCLICAL
USES OF WEIGHTED AND MOVING AVERAGES etc.
DATA FROM 'INPUT-OUTPUT' MODELS
USE OF ECONOMETRIC MODELS
STATISTICAL SAMPLING TECHNIQUES

USE OF JUDGEMENT:
COMMON SENSE

COMPARISONS OF RESULTS UNDER DIFFERENT METHODS:
FAMILY BUDGET SURVEYS; DISPOSABLE INCOME ESTIMATES
INTERNATIONAL COMPARISONS USING PUBLISHED DATA FOR OTHER MARKETS
PRODUCT SUBSTITUTION IN OTHER MARKETS
EFFECTIVENESS OF IMPORT SUBSTITUTION IN OTHER MARKETS
COMPARABLE CASES OF EXPORT PROMOTION AND RESULTS ACHIEVED
CHECKING OUT THROUGH USE OF CAREFULLY DESIGNED SAMPLING

WHERE TO SEEK ASSISTANCE:
'WHEN' IS AN INDIVIDUAL DETERMINATION
USE OF CONSULTANTS; INDUSTRIAL ENGINEERING AND OTHERS
POSSIBILITY OF 'REPROCESSING' ORIGINAL DATA (ex. CUSTOMS DATA) TO FIND REQUIRED INFORMATION USING ORIGINAL DOCUMENTS
USE OF THE POTENTIAL MACHINERY SUPPLIER
USE OF THE APPROPRIATE INDUSTRY TRADE ORGANIZATION
MARKET RESEARCH
Orientation (4)

OBJECTIVES:

DETERMINE:
- PRODUCT SPECIFICATION
- MANUFACTURING QUANTITY
- SALES PRICE

MARKET LIMITATIONS:
- TYPE OF DOMESTIC DEMAND/ CONSUMER PREFERENCES
- PRODUCTION LIMITATIONS & FORECAST DEMAND
- POTENTIAL TO EXPORT
- DISTRIBUTION AND PRICE STRUCTURE/
  PRICE CONTROLS

CATEGORY OF MARKET:
- CONSUMER GOOD // DURABLE; NON-DURABLE
- INDUSTRIAL GOOD
- LINKAGES WITH OTHER PRODUCT PRODUCTION

DEMAND FACTORS:
- IDENTIFICATION OF TRENDS
- PRODUCT SUBSTITUTION

MARKET RESEARCH TECHNIQUES (Vocabulary)
- MARKET SECTORS/SEGMENTS = FRACTURIZATION

RESUPPLY OF MARKET DEMAND:
- PRODUCT LIFE CYCLE
- PLANNED OBSOLESCENCE

COLLECTION OF DATA:
- CORRELATION WITH 'KNOWN' TRENDS
- DEMAND INTER-RELATIONSHIPS
- AVAILABLE STATISTICS

ESTIMATION OF FUTURE DEMAND:
- NOT A SCIENCE; MORE OF AN ART
- INFLUENCE OF EVENTS - PLANNED and UNPLANNED
- SENSITIVITY TO WHAT FACTORS

INFLUENCE OF PRODUCT SPECIFICATIONS:
- QUALITY VERSUS PRICE OBJECTIVES
- DISTRIBUTION LIMITATIONS AND RESTRAINTS

DEMAND CREATION/SUBSTITUTION
- ADVERTISING etc.

OTHER POSSIBILITIES

IS IT NECESSARY TO USE A CONSULTANT? ?
TEACHING MATERIALS AND OUTLINES FOR SLIDES

Refer Section: A
Module: II
MARKET RESEARCH
Discussion

DEMAND and MARKETING ANALYSIS

A. MANUFACTURER'S CRITERIA TO PRODUCE A PRODUCT

B. MARKET ASSESSMENT
   1. PRODUCT CLASSIFICATION: Consumer
      (by Market destination) Industrial
   2. PRODUCT SPECIFICATIONS and CHARACTERISTICS

   - MARKET SUPPLY
     1. Present - Production
        Imports
        Substitutes
     2. Future

   - MARKET DEMAND
     1. Is present SUPPLY equal to DEMAND?
     2. If not, what are restraining factors?
        Will they continue to affect new project?

   - PRICE LEVELS and TRENDS
     1. Factors influencing price levels:
        * Quotas, Import duties, (ie; Tariff Bariers)

   - CHANNELS of DISTRIBUTION
   - GOVERNMENT POLICIES

C. SALES FORECASTING METHODS
   * This is the objective of the exercise (Ref; Manual)

D. ESTIMATED SALES REVENUES
   - VOLUME DETERMINANTS / PRODUCTION PROGRAM CAPABILITY
   - PRICE OBJECTIVES:
     1. MAXIMIZE ROI
     2. MAXIMIZE PENETRATION of MARKET/INCREASE MARKET SHARE
     3. STABILIZE MARKET; DEVELOPMENT OF LOCAL MATERIALS

   - COST of SALES
     1. METHODS of MARKET PROMOTION
     2. ALTERNATIVES IN CHANNELS OF DISTRIBUTION
     3. Determined by: MARKET CHARACTERISTICS
        - PRODUCT (perishable, durable, size etc.
        - CUSTOMER PREFERENCES and RESTRAINTS
        - DISTRIBUTION CHANNELS and RESTRICTIONS
TEACHING MATERIALS AND OUTLINES FOR SLIDES

MARKET STRATEGIES

Refer Section: 4A
Module: II
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<th>TITLE: LIST OF DATA SOURCES</th>
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- Geneva publications.
- Paris.
- 2 rue Andre-Malraux, 75775 Paris Cedex 16, France

**CHamber of Commerce of the United States**
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- 221 Seventh St., Garden City, N.Y. 11530, USA

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US DEPARTMENT OF AGRICULTURE
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Materials handbook - an encyclopedia for purchasing
agents, materials executives, and foremen.
10th ed.
1221 Avenue of the Americas, New York,
NY 10020, USA.

BEAN J.
Dictionary of economics and commerce.
Eastcote, Plymouth PL6 7HW, UK.

FINANCE MANAGEMENT (A quarterly )
World Trade Publications, P. O. Box 37023
Washington DC 20009 USA.

BE glossary: English-French-Spanish.
Washington, D.C. 20031, USA.

....../3.
Cont'd

PERLUEN DICTIONARY OF LEXICONS.
Allen Lane, 17 Grosvenor, London W1, UK.

GUIDE'S ANNULAR YEAR BOOKS.
Greyston, Household Furniture Directories.
Windsor Court, East Grinstead House,
East Grinstead, West Sussex BR11 3TB, UK.

PRINCIPAL INTERNATIONAL BUSINESSES;
THE WORLD DIRECTOR DIRECTORY.
P. O. Box 3221, Church Street Station,
New York, N.Y. 10004, USA.

WORLD WIDE CHAMBER OF COMMERCE DIRECTORY
Loveland, John.
Box 266, Loveland, Colorado 80537, USA.

ACP STATES YEARBOOK. contains DFS items
ACP: Brussels, Editions Folla.
92-94 Square F. Plasky, B-1040 Brussels,
Belgium.

Economic Yearbook of Member States of
the Organization of African Unity.
Termini, E.N.C.A.
B. P. 146, 65100 Termini, Italy.

AMERICAN EXPORT REGISTER.
New York, Thomas International Publishing Co.
One Penn Plaza, 250 West 31st Street, New York,
NY 10001, USA.

AMERICAN EXPORT REGISTER.
New York, Thomas International Publishing Co.
One Penn Plaza, 250 West 31st Street, New York,
NY 10001, USA.

LOHMAN, NY
Fox to write a report your lens will read and
understand.
LOHMAN, Ill., Fox Jones-Tran, 1971, 9x, 215 p.
1813 Ridge Road, Roxwood, Ill. 66136, USA.

CHINA'S COLLEGE AND TRAVEL AND INTERNATIONAL,
PUBLISHING.
London, Queen's Commerce and Travel Ltd.
100 Bulsion Lane, London EC5X 2H, UK.
WELL-B IN HULLS
London, Economist Newspaper.
25 St. James's Street, London SW1 1AA, UK.

Union of International Associations
DIRECTORY OF INTERNATIONAL ORGANIZATIONS.
Brussels.
1 Rue de Laeken, 1000 Brussels, Belgium.
Association of Africa Trade Promotion organizations.
DIRECTORY OF TRADE PROMOTION INSTITUTIONS IN
Africa.
Tangiers.
P. O. Fox 23, Tangiers, Morocco.
Appendix 2

Annotated select bibliography for basic market information

MACROECONOMIC RESEARCH

1. International Financial Statistics
   Frequency of publication: Monthly
   Publisher: International Monetary Fund (IMF), 19th and H Streets, N.W.,
   Washington, D.C. 20431
   Price: $10 per year (including annual supplement)

2. Yearbook of National Accounts Statistics
   Frequency of publication: Annual
   Publisher: United Nations, New York
   Price: $7 (1966)
   Detailed estimates of national income and related economic measures
   for about 100 countries. Among the subjects discussed are: expenditure
   on gross national product, distribution of national income, composition
   of private consumption expenditure, general government revenue and
   expenditure, and external transactions. Published since 1955 and avail-
   able on standing order.

   pays de l'OCDE, 364pp.
   Date of publication: 1969
   Publisher: Organisation for Economic Co-operation and Development
   (OECD) 2, rue André Pascal, Paris 16e
   Price: $6.50
   Statistical tables showing, for each of the member countries of OECD,
   including Finland, as well as for total OECD, European OECD and the EEC,
   the main aggregates of national accounts. Special tables give growth
   triangles, price and volume indices, ratios between selected aggregates.

   nationaux des pays moins développés, 216pp.
   Date of publication: 1968
   Publisher: Organisation for Economic Co-operation and Development
   (OECD), 2, rue André Pascal, Paris 16e
   Price: $5.50
   Part I: Date on real product, population and real product per capita;
   Part II: Data on growth of value added by main industrial sectors;
   Part III: National accounts tables for seventeen less developed
   countries selected for their economic role.
5. Main Economic Indicators
   Frequency of publication: Monthly
   Publisher: Organisation for Economic Co-operation and Development (OECD), 2, rue André Pascal, Paris 16e
   Price: $1.50 per issue, $19.50 per year (including supplements)

An essential source of statistics for the student of the international business cycle. Provides a picture of the most recent changes in the economy of the member countries of OECD, together with a collection of international statistics on economic development affecting the OECD area in the past few years.

RESEARCH ON INTERNATIONAL TRADE STATISTICS

   Date of publication: 1967
   Publisher: International Trade Centre (ITC) UNTAD/GATT, Palais des Nations, CH-1211 Geneva 10
   Price: £5.10, free to developing countries

Lists production statistics for 163 countries and territories.

   Date of publication: 1963
   Publisher: United Nations, New York
   UN Sales Number: 64.XVII.2, 64.XVII.3
   Price: Vol.I - $5.00, Vol.II - $4.50

Two volumes bringing the original Indexes up to date and classifying about 30,000 articles of commerce. Volume I consists of an item index showing for each item of the Standard International Trade Classification, Revised (SITC, Rev.), the principal articles falling within the item. Volume II begins with the SITC, Rev., followed by the Alphabetic Index, containing the result of alphabetizing all the entries occurring in the Item Index, together with new entries resulting from such rearrangements or modifications of the wording of the basic entries as were thought to be needed, amounting to about 45,000 entries. Once a product has been identified in this work, one may consult the World Trade Annual (see item 8 below).

   Frequency of publication: Annual
   Publisher: Walker and Company, 720 Fifth Avenue, New York, N.Y. 10019
   Price: $33.00 per volume, $100 for the set

This work gives data for 90 per cent of world trade. To use it, access to the Commodity Indexes for Standard International Trade Classification (see item 7 above) is essential. The four volumes contain detailed...
export and import statistics for 24 developed countries: Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Federal Republic of Germany, Finland, France, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States and Yugoslavia.


Publisher: Walker and Company, 720 Fifth Avenue, New York, N.Y. 10019
Price: $50.00 per volume, $250.00 for the set

Each volume shows the trade of the 24 developed countries with other regions: Eastern Europe, Latin America, Africa and the Far East. Although this is a costly publication, every embassy and trading board should purchase it and thus help its exporters to find new markets.

10. Commodity Trade Series (Statistical Papers, Series D)

Frequency of publication: About 25 issues per year
Publisher: United Nations, New York
Price: $1.50 per issue, $25.00 per year

Issued in fascicles of about 200 pages as quarterly data become available, this series contains international commodity tables, according to the SITC, Rev., showing the imports and exports of countries reporting according to that classification (taken together, without duplication, the imports and exports of these countries cover about 50 per cent of world trade). Within commodity headings trade is analyzed by country, region of provenance and destination. Figures are in US dollars and metric units of quantity.

11. Yearbook of International Trade Statistics

Frequency of publication: Annual
Publisher: United Nations, New York
Price: $11.50 (1964)

A compilation of national tables showing annual figures for several years for over 130 countries, and summaries of trade by large commodity classes and by principal regions and countries. Published since 1951 and available on standing order.

12. Trade by Commodities: Market Summaries/Échanges par produits. Résumé par marché (Foreign Trade Statistics, Series G)

Frequency of publication: Half-yearly
Publisher: Organisation for Economic Co-operation and Development (OECD) 2, rue André Pascal, Paris 16
Price: $19.50 per year

Detailed information on the trade of OECD countries by commodities (defined according to the SITC) and partner countries. Data in terms of both value and quantity are presented in synoptic tables, bringing
together the countries comprising the market for a commodity, as outlets and/or sources of supply. This series has been published since 1959, and its presentation is now in three volumes: General, Imports, Exports. While this work is less detailed than the World Trade Annual (see item 8 above), it is much less costly.

13. Trade Yearbook
Frequency of publication: Annual
Publisher: Food and Agriculture Organization of the United Nations (FAO), Via delle Terme di Caracalla, Rome
Price: $6.00
Covers about 200 agricultural products throughout the world.

14. Foreign Trade: Analytical Tables (Imports, Exports) (German and French)
Frequency of publication: Quarterly in two volumes
Publisher: Statistical Office of the European Communities, 170, rue de la Loi, Brussels 4
Price: BF 850 per year

RESEARCH ON PRODUCTION STATISTICS

Date of publication: 1967
Publisher: International Trade Centre (ITC) UNCTAD/GATT, Palais des Nations, CH-1211 Geneva 10
Price: $5.00, free to developing countries

16. Production Yearbook
Frequency of publication: Annual
Publisher: Food and Agriculture Organization of the United Nations (FAO), Via delle Terme di Caracalla, Rome
Price: $9.00

17. Commodity Yearbook
Frequency of publication: Annual
Publisher: Commodity Research Bureau, 82 Beaver Street, New York, N.Y. - 10005
Price: $14.00

1/ The products described in this work are listed in page 70.
RESEARCH ON TRADE ASSOCIATIONS

   Date of publication: 1966
   Publisher: International Trade Centre (ITC) UNCTAD/GATT, Palais des Nations, CH-1211 Geneva 10
   Price: Free to developing countries

   Frequency of publication: Annual
   Publisher: Europa Publications Ltd., 13 Bedford Square, London, W.C.1
   Price: £13

   Date of publication: 1966
   Publisher: CBD Research Ltd., 114 High Street, Beckenham, Kent, UK
   Price: $13.50

21. Trade Directories of the World, compiled by U. H. E. Croner
   Frequency of publication: first published 1952, monthly amendments
   Publisher: Croner Publications Inc., 211-03 Jamaica Avenue, Queens Village, N.Y. 11428
   Price: $20 (incl. amendment service)
   Loose-leaf format with monthly amendments.

DESK RESEARCH ON DEMAND

   Date of publication: 1966
   Publisher: McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York, N.Y. - 10036
   Price: $370

   Date of publication: 1963
   Publisher: McGraw-Hill Book Co., 330 West 42nd Street, New York, N.Y. - 10036
   Price: $19.50
24. Demographic Yearbook (bilingual: English/French)

Frequency of publication: Annual
Publisher: United Nations, New York
Price: $11.00 (1967)

International demographic statistics for over 250 countries and territories. Basic data on area, density, population growth rates, natality, mortality, life expectancy, nuptiality and divorce. Each issue also includes extended data on a special demographic topic. Published since 1949 and available on standing order.

25. Statistical Yearbook (bilingual: English/French)

Frequency of publication: Annual
Publisher: United Nations, New York
Price: $15.00 (cloth); $11.00 (paper) - 1965 volume

Annual statistical data for more than 270 countries and territories covering a wide range of economic and social subjects, including: population, agriculture, manufacturing, construction, transport, trade, balance of payments, national income, education and culture. Published since 1949 and available on standing order.

26. Sources statistiques des études de marchés/Sources of Statistics for Market Research, guides prepared by C. Kapferer

Vol.1 Appareils de radio/Radio Sets, 1961
Vol.2 Chaussures/Bootwear, 1962, Europe and North America
Vol.4 Appareils ménagers/Household Appliances, 1963, Europe and North America
Vol.5 Machines-outils/Machine Tools, 1963, Europe and North America
Vol.6 Produits pharmaceutiques/Pharmaceuticals, 1963, Europe and North America

Price: $6.50
Price: $10.00
Price: $2.50
Price: $6.50
Price: $3.00
Price: $6.50

Publisher: Organization for Economic Co-operation and Development (OECD), 2, rue André Pascal, Paris 16e.

27. Social Statistics: Special Series of Economic Accounts,
(bilingual: French/German or Dutch/Italian)

Frequency of publication: 4 to 6 issues per year
Publisher: Statistical Office of the European Communities, 170 rue de la Loi, Brussels 4
Price: BF 1,200 whole series; BF 200 per issue

Seven issues: one for each EEC member country and a general survey.
INFORMATION ON PRICES

   Date of publication: 1959
   Publisher: Special Libraries Association, 31 East Tenth Street,
             New York 5, N.Y.
   Price: $5.00
   This work is limited to American and Canadian journals. The body of
   the work is an alphabetical list of commodities. For each commodity
   the following information is provided: name of commodity, title of
   periodical publishing the price, market or markets in which price is
   effective and the frequency with which prices appear in the periodical.
   The appendix gives an alphabetical list of periodicals covered in the
   main part of the book, together with publisher, address of publisher
   and frequency of publication.

29. Agricultural Statistics (bilingual: German, French)
   Frequency of publication: At least 8 issues yearly
   Publisher: Statistical Office of the European Communities, 170 rue de
             la Loi, Brussels 4
   Price: BF 450 per year; PF 75 per issue
   Each issue is divided into 3 parts: agricultural costing, agricultural
   prices and price indices.

30. Wall Street Journal
   Frequency of publication: Daily
   Publisher: Dow Jones and Co., 30 Broad Street, New York, N.Y. - 10004
   Price: $30 per year
   Leading American financial paper.

31. Oil, Paint and Drugs Reporter
   Frequency of publication: Weekly
   Publisher: Schnell Publishing Co., 100 Church Street, New York, N.Y.
             - 10007
   Price: $15.00 per year

32. International Customs Journal
   Frequency of publication: Irregular
   Publisher: International Customs Tariff Bureau, 38, rue de l'Association,
             B-1000 Brussels
   Price: Available only from the competent national administrations
          (finance, customs, etc.) of member countries. Price varies. Contains
          complete, updated tariff schedules for selected countries.
33. Deutsches Handelsarchiv (German Trade Archives)
Frequency of publication: Twice monthly
Publisher: Bundesministerium für Wirtschaft, Bonn, Federal Republic of Germany
Price: DM 110 per year
World-wide coverage of tariffs and trade regulations, changes and trade agreements. Up-to-date information.

34. International Commerce, prepared by the US Department of Commerce
Frequency of publication: Weekly
Price: $16.00 per year, $5.00 additional for foreign mailing
A special Foreign Government Actions column covers changes in tariffs and trade regulations all over the world.
International Commerce Reprints: World-wide Tariff Guide
World-wide Customs Data
World-wide Import Rates

Date of publication: 1966
Publisher: Croner Publications, 211-03 Jamaica Avenue, Queen's Village, N.Y.
Price: $25.00, including amendment service
Loose-leaf handbook with a monthly amendment service, covering all the countries in the world. Contains general background information, documentation requirements, packing, marking and labelling, various certificates required, import and exchange controls, transportation and insurance.

Date of publication: 1969
Publisher: Dun and Bradstreet Publications Corp., P.O.B. 3088, Grand Central Station, New York, N.Y. - 10017
Price: $50.00, including up-to-date supplements
Import and exchange regulations, general export information on law, export terms and control, shipping, packing, marking of origin and other rules, all on an individual country basis for 220 world markets.

37. Export Documentation, 3 vols.
Date of publication: 1967, yearly updating supplements
Publisher: Associated Chambers of Manufacturers of Australia, Industry House, Canberra
Price: $20.00 per volume, $6.00 for yearly supplements
Loose-leaf handbook with regular amendment service. Covers all countries and lists their requirements on documentation, import and exchange controls, tariffs, packing, packaging, marking, labelling, sanitary and other required certificates.

38. International Advertising Standards and Practices
Publisher: International Advertising Association, 475 Fifth Avenue, New York, N.Y. - 10017
Contains general information on advertising in 60 countries

MISCELLANEOUS SOURCES

39. Export Marketing Research for Developing Countries
Date of publication: 1967
Publisher: International Trade Centre (ITC) UNCTAD/GATT, Palais des Nations, CH-1211 Geneva 10
Price: $5.00, free to developing countries

40. An Annotated Bibliography of Market Surveys by Products and Countries
Date of publication: 1969
Publisher: International Trade Centre (ITC) UNCTAD/GATT, Palais des Nations, CH-1211, Geneva 10
Price: $5.00, free to developing countries

Date of publication: 1964
Publisher: United Nations Educational, Scientific and Cultural Organization (UNESCO), Place de Fontenoy, 75 Paris 7e
Price: $2.50

Chapters on: different types of exchange, the organization of national and international exchange services; conventions and agreements for the exchange of publications; transport and customs; list of exchange offers of international organizations; etc. A select list of current international directories, a subject index and an index to countries are also provided.

Frequency of publication: Annual
Publisher: R. R. Bowker Co., 1180 Avenue of the Americas, New York, N.Y. - 10036
Price: $30.00
This directory can be used to identify periodicals dealing with specific products.
43. Compilation of Basic Information on Export Markets

Date of publication: 1968
Publisher: International Trade Centre (ITC) UNTAD/GATT, Palais des Nations, CH-1211 Geneva 10
Price: $5.00, free to developing countries

More general information is available from such sources as:
The selected commodity price publications of
Merrill Lynch, Pierce, Fenner and Smith, Inc.
70 Pine Street
New York, N.Y. - 10005;
The publications of the Food and Agriculture Organization of the United Nations (FAO), Via delle Terme di Caracalla, Rome, on the prices of agricultural goods;
The catalogues of mail-order houses, for the prices of consumer goods;
Commodity exchange quotations;
The various trade journals for industrial products.

44. SPECIAL CALCULATORS: Hewlett-Packard Personal Computer Digistar
Hewlett-Packard Company.
1000 North East Circle Blvd., P.O. Box 999
Corvallis, Oregon 97330 U.S.A.

Other Books: Investment Analysis and Statistical Applications (90026)
               Marketing and Forecasting Applications (90049)

U.S. SALES
REFINI COMPUTIC CENTER INC.
28251 Ford Road
Gardena City, Michigan 48135 U.S.A
TELEPHONE: (313) 261-0424

Price Example. HP 12 C - $90.00 + 5% 
               41C - $150.00 + 
               41CV - $210.00 + 

45. NIGERIAN CONSULTANTS ORGANIZATION:
Institute of Management Consultants - IMC.
14 Kagoro Close
P.O. Box 9194
Kaduna, Nigeria
TEL. 062-211437
TEACHING MATERIALS AND OUTLINES FOR SLIDES

PRICING POLICY

Refer Section: 13
Module: II
MARKET and DEMAND

PRICING POLICY

ALTERNATIVE METHODS OF PRODUCT PRICING:

THE COST APPROACH:

TOTAL COSTS PLUS PROFIT:

<table>
<thead>
<tr>
<th>COSTS</th>
<th>TOTAL (Gross)</th>
<th>UNIT (At PRODUCTION CAPACITY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Materials:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Labor:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Labor: (Associated w/ Production)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utilities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-Total Variable Costs:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overheads:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Labor: (Not Associated w/ Production)</td>
<td></td>
<td>Factory Cost *(Variable)</td>
</tr>
<tr>
<td>Administration: (incl. sales/distribution costs)</td>
<td></td>
<td>Operating Cost</td>
</tr>
<tr>
<td>Amortization of:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment &amp; Facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest/Financing Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production Taxes:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-Total = Fixed Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total/Variable and Fixed Costs * Production Cost</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ADD: PROFIT AND TAXES:

(Based on a predetermined R.O.I.)

TOTAL PRODUCTION COSTS:

IS THIS UNIT COST THE COST AT ALL LEVELS OF PRODUCTION?
MARKET and DEMAND

PRICING POLICY (2)

PROBLEMS WITH THE COST APPROACH:

1. Not reflective of ACTUAL UNIT COST
   DURING START-UP PERIOD
   IF MAXIMUM CAPACITY IS NOT REALIZED:
   - DUE TO TECHNICAL DIFFICULTIES
   - DUE TO LACK OF SUFFICIENT DEMAND

2. Not reflective of MARKET CONDITIONS
   COMPETITION:
   - FROM OTHER PRODUCERS
   - FROM IMPORTS (Including Smuggling)
   - FROM CONSUMER SUBSTITUTE

   WHAT ABOUT CONSUMER'S MARGINAL WILLINGNESS
   (AND, IN SOME CASES, ABILITY) TO PAY...
   THE SUPPLY/DEMAND CURVE?

BASIC NEED TO COVER 'VARIABLE COSTS'

HOW LONG TO WAIT BEFORE PROFIT PROJECTIONS CAN BE REALIZED?

CONTRIBUTIONS TO OVERHEADS:
   GRADUAL ABSORPTION BY MARKET OF FIXED COSTS

ALTERNATIVES:
   MONOPOLY GIVEN BY GOVERNMENT FOR INITIAL PERIOD
   IMPORT RESTRICTIONS
   TARIFF OR QUOTA BARRIERS

RETURN TO PROBLEM OF PLANT CAPACITY SIZE:
   'OPTIMUM ECONOMIC PLANT SIZE'
   THE "LEARNING CURVE"
   OR PRODUCTION START-UP CURVE
MARKET and DEMAND

PRICING POLICY (3)

PRICE DETERMINATIONS: OUTPUTS:

IF IMPORT SUBSTITUTION:
OUTPUTS MIGHT BE PRICED AT:

C.i.f. PRICE, including
IMPORT TAXES AND DUTIES,
INTERNAL AND PORT CHARGES
FOR CLEARING and TRANSPORT
TO WAREHOUSES
INSURANCE, etc.

IF PRODUCT IS ALREADY MARKETED INTERNALLY:
OUTPUTS MUST BE REFLECTIVE OF THE
COMPETITIVE PRICE STRUCTURE TAKING
INTO CONSIDERATION QUALITY DIFFERENCES

IF PRODUCT IS DESTINED FOR EXPORT:
OUTPUTS MUST RELECT COSTS TO DELIVER TO
THE EXPORT MARKET—UNLESS:

PROJECT IS UNDERTAKEN TO EARN FOREIGN EXC
THEN A GOVERNMENT SUBSIDY, OR SOME ADDITION
FROM FOREIGN EXCHANGE MUST BE FACTORED IN
THE PROJECT PROFITABILITY

PRICE DETERMINATIONS: INPUTS:

IF MATERIALS ARE IMPORTED, PRICE/COST VALUE
SHOULD BE ACTUAL C.i.f. PRICE PLUS CHARGES

IF MATERIALS ARE LOCALLY PRODUCED:

COSTS FOR THE FINANCIAL ANALYSIS OF THE PROJECT
PROFITABILITY SHOULD BE BASED ON COSTS PREVAILING
IN THE LOCAL MARKET. WHERE NO LOCAL MARKET EXIST
THE COST F.o.b. THE PORT OF EXIT FOR EXPORTED RA
MATERIALS WOULD SEEM APPROPRIATE

THE HANDOUT ON PRICE DETERMINATION AND
GOVERNMENT PRICING POLICY
ANNEX 8: Teaching Materials and Outlines for Slides,
Module III: Technical Analysis
MODULE III

TECHNICAL ANALYSIS

Lectures and exercises.

Table of contents:

1. Overview of the technical analysis.
2. Technical aspects of the production programme and plant capacity.
4. Materials and inputs.
8. Technology cost. Exercise.
12. Project implementation.
13. Negotiations of the contracts.
Chapter I. Overview of the technical analysis.

Lecture content:
1. Time sequence of different activities in the project development.
2. Hierarchy of preparatory activities.
3. Procedures and stages of project development.
4. What is to be designed?
5. How extensive should engineering study be?
6. Technical aspects of the project feasibility.
7. Investment-production cycle. Impact of different variables on feasibility of the project.

Comments:

1/ Every action which is to be undertaken in any of the systems belongs to the one of the stages:
   - preparatory stage
   - realization stage

Sometimes preparatory stage is performed several milliseconds before realisation /action of the boxer/, but very often preparatory action is overtaking the realisation stage long time /erection of big dam/. This classification is of the hierarchical character. It means that the previous action is preparatory to the following one. But also in the preparatory action one clearly define the preparatory and realization stage.

Industrial development which is time dependent change of production and economical structures needs also preparatory stage. Production of goods and commodities needs to use installations, plants. This physical structure needs to be artificially erected and afterwards operated at the flow of materials and using energy, managerial and workers skill.

It means that erection of the facility, is a preparatory stage in the context of the production stage. What is than preparatory stage for the physical process of the plant erection. Of course those are all activities described as design and engineering, to which preparatory is the decision to undertake such investment. Feasibility study serves to help this decision making process.
2/ Definitions:

Function—transformation of a state of flow which can be measured by change of at least one of parameters of this flow.

Processing element—Piece of hardware having structural properties.

Processing unit—set of processing elements which can perform at least one function.

Technological unit—set of processing units transforming marketable input to salable output.

Installation—technological unit supported by service chains like water, energy, conveyers, storages etc.

Plant—set of installations which under management functions can perform technically autonomously.

Enterprise—at least one plant organized to perform economical function.

Company—at least one enterprise with financial functions.

3/ Research and design cost is growing exponentially with the volume of knowledge collected and process properties precise description. Laboratory research, models, pilot plants, engineering calculations however are introducing higher probability of the success in the project commercial implementation. Therefore risk and cost of failure are reduced at extensive investigation of the project. Those two functions are defining the feasible range of extensivity of the engineering study.
Time sequence of different activities in the process of project development.
Hierarchy of preparatory activities.
Investment - production cycle

Properties:

a) time sequence
b) specific structure of the cost-profit areas.
\begin{align*}
\int_{0}^{t_1} K(t) \, dt & \quad \int_{t_s}^{t_f} P(t) \, dt \\
a) \ t_1 \ value & \quad a) \ \text{market demand} \\
b) \ \text{cost} K(t) & \quad b) \ \text{price of product} \\
c) \ \text{rate of interest} & \quad c) \ \text{technical failures} \\
d) \ \text{production cost} & \quad d) \ \text{production cost}
\end{align*}

Impact of different variables on economical feasibility of the project.
Processing element

Processing unit

Technological unit

Installation

Plant

Enterprise

Factory

Company

Enterprise

+ Service chains and facilities
+ Management functions
+ Trade functions
+ Financial functions

What is to be designed?
1 - cost of the unfeasible solutions
2 - cost of the research, design and alternatives comparison.

How extensive should engineering study be?
EVALUATION OF GOALS OF THE PROJECT

EXISTING COMMODITY

OLD

APPLICATION

NEW APPLICATION

OLD TECHNOLOGY

NEW TECHNOLOGY

OLD TECHNICAL STRUCTURE

NEW TECHNICAL STRUCTURE

OLD MATERIALS

NEW MATERIALS

TOTAL NUMBER OF PATHS: 32
<table>
<thead>
<tr>
<th>Assured</th>
<th>If properly designed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal feasibility</td>
<td>Market</td>
</tr>
<tr>
<td>Functional feasibility</td>
<td>Production programme</td>
</tr>
<tr>
<td>Technical feasibility</td>
<td>Design and engineering</td>
</tr>
<tr>
<td>Resources feasibility</td>
<td>Technology</td>
</tr>
<tr>
<td>Infrastructural feasibility</td>
<td>Materials and inputs</td>
</tr>
<tr>
<td>Implementation feasibility</td>
<td>Location and site</td>
</tr>
<tr>
<td>Operational feasibility</td>
<td>Investment realization</td>
</tr>
<tr>
<td>Human feasibility</td>
<td>Production realization</td>
</tr>
<tr>
<td>Environmental feasibility</td>
<td>Manpower and management</td>
</tr>
<tr>
<td></td>
<td>Development programme</td>
</tr>
</tbody>
</table>

Aspects of project feasibility.
Chapter 11. Technical aspects of the production programme and plant capacity.

Lecture content:
1. Production programme over the life span of the plant.¹
2. Scheduling of the production process. Cases of production schedule.
3. Plant capacity concept.² Relations between different capacity concepts.
4. Relation between plant capacity and production cost.
5. Is the capacity technically unlimited? Physical, technological logistic and marketing options and constraints of the plant capacity.³
6. Optimum economic capacity of the installation.

Comments:

¹ Evaluated on the basis of marketing studies and sectoral analysis; product demand has to be translated into production programme. The first problem to be discussed is demand versus time relation. Evaluated demand can be never achieved at the first year of the production. There are two main reasons of such situation:

- market is not ready to consume new product
- technical structure of the plant, skills of management and workers

Therefore from this point of view production programme is a time dependent function.

² Influence of these factors are not constant during the different periods of plant operation. It could be shown that generally exists three periods of plant production schedule: the start up period, the normal operation period and obsolete technics operation period.
Type of the industry to which belongs project has another impact on production programme. Industries are working different time schedule dependent on their hard ware characteristics. All the industries we divide into two classes:

- continuously working three shifts
- interrupting process after first or second shift

In every case production process can organized batch-wise or at constant flow. It is easy to prove that in each case the production programme will be estimated differently.

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2/ Capacity is a definition of measure of some output in agreed time period.

That incure necessity to establish the time in which we are intended to measure the output and to estimate if during that time the output can be considered as constant. The first measure is output in hour of production, the others could be monthly and yearly rates of production. But monthly and yearly rates of production are not the result of simple multiplication of the respective time on hour's output. Taking into account these remarks we can define several capacities of the same production facility:

- installed capacity /nominal time hour output/
- nominal maximum capacity /defined time x defined hour output/
- feasible normal capacity /feasible time x feasible hour output/
- statistical capacity /data collected from reports/

What are major factors which infringe possibility to operate plants with installed capacity:

- natural time breaks /holidays, shift patterns, combination of different machines to different products/
- technical time breaks /exchange of tools, catalysts, maintenance/
- output-input limitations /supply of raw materials and sales of products, utility supply breaks, spare parts availability/
- management system limitations /skill of managers and workers, periodical lack of labor forces, failures of the training system/
- stochastic breaks /accidents, fires, explosions
3/ Now it is necessary to resolve the problem of minimum economic size of the production line and/or whole installation. Simple calculations are showing that unit cost is in the relation with production capacity of pipe, valve, reactor, and other categories of the equipment. The cost of square meter of building as well as other civil works shows the same relationship. It means that unit investment cost of bigger installation is lower. If that relationship would be the only one, the most economical way of every production realization is the one plant for whole the world. But of course, there are many constraints to that solution. They can be divided into several groups:

- physical constraints /every kind of hard ware can be built only maximum dimensions, because of resistance of materials and weight considerations/
- technology capability /technological process is standardize and can not overcome some dimensions of principal equipment /e.g. from the point of view heat exchange volume/surface relationship/
- logistic reasons /at growing concentration of industrial unit the cost of transportation, cost of the storages and cost of supply of the utilities is much larger per unit of the product/
- market reasons /market is not ready to absorb new production and is not ready to meet the demand on raw materials at the level of acceptable for the process prices. /

To avoid extremely high cost of engineering studies of different sizes of the installations simple equations can be applied:

\[ I_b = I_s \left( \frac{P_b}{P_s} \right)^X \]
\[ C_b = C_s \left( \frac{P_b}{P_s} \right)^Y \]

Where:  
- \( I_b, I_s \) - capital requirement for bigger and respectively smaller size plants  
- \( P_b, P_s \) - capacities of bigger and smaller plants  
- \( C_b, C_s \) - production cost of bigger and smaller capacity plants

But the exponential rule has its limitations, and can be applied only in defined region of the capacities of the equipment as well as of the complete installations.
In complicated cases where high capital involvement is expected there is necessary to prepare engineering study on the capacity of the plant. The study can be limited to critical equipment and all the rest can be added proportionally. If standard type equipment is included in the installation there it is necessary to seek complete quotations from producers for several capacities.
Inventories \( M(t) \)

\[ M \]

1 2 3 Time

Inventories \( Q(t) \)

\[ q \]

Output \( P(t) \)

\[ P \]

Sales \( S(t) \)

\[ S \]

Production planning objectives
Estimated production programme

Production programme over the life span of the plant:

I period 2-5 years
II period 10-15 years
III period 5-6 years
Cases of production schedule.

I - one shift per day
II - weekend break
III - multiproduct batch plant
IV - continuous seasonally adapted
Relations between different capacity concepts.

\[ Q_i = q_i \times 8760 \text{ units/year} \]
\[ Q_n = q_n \times 8000 \text{ units/year} \]
\[ Q_f = q_f \times 7600 \text{ units/year} \]
\[ q_s = \frac{\Sigma q_s \cdot t_e}{T} \text{ units/year} \]
The same capacity $3f_1 = f_2$

Height proportion
- $f_2 = 9.42 \times 10^{-4}$
- $v_2 = 48.38 \times 10^{-3}$

Growth factor of one tube capacity
- $g_2 = 1.93$

Growth factor of one tube weight
- $1.62$

Economy of the scale

$$q_1 = q_2 \ (m^3/h)$$

$$f_2 = f_1 \left( \frac{v_2}{v_1} \right)^x$$
- $x = 0.72$
- $h_2 < h_1$

Technological constraints of the scale growth
Impact of different options and constraints on minimum economic capacity.

1, 2 - physical or technological constraints
3 - logistic options
4 - marketing options
Minimum economic capacity determination.

2 - investment cost
3 - logistic costs
4 - marketing costs
5 - total costs
Chapter IV. Materials and inputs.

Lecture content:

1. Significance of the materials and inputs availability, quality and price for the project feasibility.
2. Classification of materials and inputs 1/
3. Properties of the materials and inputs 2/
4. Supply programme
5. Cost of materials and inputs 3/
6. Utilities 4/

Comments:

1/ The main goal of the production process is the transformation of flows. The inputs generally depend on technology, techniques of the processing, which are adapted to defined production programme. Therefore adequate range of materials or their substitutes should be in demanded quantity and quality. There is a close relationship between the definition of the input requirements and other project problems.

All the materials and inputs can be classified into several groups:

- raw materials /unprocessed and semi-processed materials/
- processed industrial materials
- components
- auxiliary materials
- factory supplies
- utilities

Raw materials are the most important group from the point of view of availability and logistics. This group can be classified as follows:

- agricultural products
- livestock origin products
- forestry origin products
- marine and water origin products
- mineral products /mineral ores and nonmetallic minerals/

Every class of raw materials has its options and constraints when use
2/ Quality of the raw materials is one of the crucial points in production process. Therefore careful analysis by the specialists is to be done. All properties should be listed and controlled:

- properties /physical, chemical, mechanical, electrical and other concerned/
- changes in the properties during the year
- handling, transportation and storage properties /kind of wrapping and packing is to be defined/ as well as all security prescriptions during this operations
- list of impurities which are not allowed by the technological process
- processing properties

The most important properties of raw materials are:
- renovability - exhaustability
- supply timing /seasonal - uniform distribution consumption/
- changeable-stable /on quality/
- concentrated-diluted

Each property has its influence on cost of the processing. Thus assuring the deliveries of the raw materials special care has to be taken and following steps observed.

- yearly quantities should be defined and for the higher part of demand long-term agreement should be prepared
- alternative resources should be allocated
- bulk purchase arrangements should be sought
- transportation agreement long term are necessary
- wastes should be determined at different supply resources
- output/yield should be controlled at last in laboratory but sometimes the tests on industrial scale are indispensable.

Foreign raw materials should be avoided, only when comfortable exchange of the raw materials against local products is assured in the delivery contract.
Second important group of inputs are the processed materials and components. Many of the indications given for the raw materials are valid in group of inputs. Important difference is laying in the standardization of the products. Processed materials are mostly subject to international or national standards and quotations and contracts are always referring to this standards. Analysis of inputs should take this into account, but it does not mean that standard specification is sufficient for every production process. It is necessary add to specifications necessary amendments and define the methods of analysis or determination of such unspecified in standards properties.

Different situation is in the case of components which are integral part of product. Because it is impossible to assure production of all components inside the one country special precaution should undertaken to assure full and qualitative supply under changeable conditions of the market. The first principle here is to avoid one supplier of the components, and than some kind of standardization is also necessary. The best solution is unconditional exchange of the components with supplier, on the balance rate of exchange.

The original producer is sometimes quickly changing the final product and than this arrangements is very important to avoid unnecessary development of the process, just started at nonreimbursed.

Third group of inputs concerns the auxiliary materials and factory supplies. Auxiliary materials could be sometimes critical for production process e.g. catalysts of the process, additives to oils and fuels, which are used in small quantity, but processing of the raw materials without this additions is impossible. Therefore they should be chosen with a big care and special contract agreements are necessary as well different schedule of deliveries /they are supposed to be contracted in bigger quantity than Economic Order Quantity./ Factory supplies should be specified in documentation of the equipment as well the spare parts. Specification should be made on the basis of the properties and characteristics of the factory supplies /not only trade names of the product/ and local products should be checked and adapted during the preinvestment stage.

Spare parts have to be specified in the engineering documentation of the equipment and definite cost of the yearly supply should be estimated. For the easily tearing/wearing parts detailed drawings are to be prepared.

Special care is necessary in the preparation of the warehouses and storages.

Physical and economical constraints should be investigated.
3/ Unit cost is to be established on the basis of price prognosis or contract.

The difference in imported and domestic materials cost is very important:

<table>
<thead>
<tr>
<th>Cost on the imported material</th>
<th>Cost on the domestic material</th>
</tr>
</thead>
<tbody>
<tr>
<td>- CIF cost/price</td>
<td>- ex-work cost/price</td>
</tr>
<tr>
<td>- clearing charges</td>
<td>- land transportation</td>
</tr>
<tr>
<td>- import duties</td>
<td>- insurance</td>
</tr>
<tr>
<td>- custom duties</td>
<td></td>
</tr>
<tr>
<td>- land transportation</td>
<td></td>
</tr>
<tr>
<td>- VAT</td>
<td></td>
</tr>
<tr>
<td>- insurance</td>
<td></td>
</tr>
<tr>
<td>- port cost</td>
<td></td>
</tr>
</tbody>
</table>

4/ Special part of the inputs are utilities. They are intensive factors for the transformation of the raw materials to ready-made products and in the most cases they do not participate physically in the product. We can specify several kinds of utilities:

- technological fuel
- steam and other heat carriers
- technological water
- cooling water
- cooling air
- other cooling agents
- special utilities (air compressed, nitrogen etc.)
- electric power

Technological fuel serves to heat furnaces where the endothermic process is carried out. There are several kinds of technological fuels: gas-methane, light fractions of the oil distillation, heavy diesel fraction, different kinds of fuel oil. The consumption is defined by the process, but for use of that kind of source of heat it is necessary to assure logistics of its supply. Gasous fuels are supplied by pipes and deaerated in gas stations. Sometimes purified from sulphur /corrosion of the furnace/. Liquid fuels are supposed to be delivered by road or railway transport.
On site it is necessary to provide reloading facilities and storages.

Steam or other heat carriers (like dowtherm) are produced on the factory in boiler section. If the use of heat energy is high enough than one should built the power station where the part of the steam energy is used to produce electroenergy. Investments in this case are higher, but at todays prices of the energy it is easy to prove that this kind of investment is economic. The steam are produced at high pressure and after turbines we can have several levels of pressure (high pressure steam like 60-80 ata, medium pressure steam like 20-30 ata and low pressure steam like 2-6 ata).

Condensate after utilisation of the steam heat is recycled to power station.

Losses are covered by specially processed water. Steam is very economic kind of heat carrier because it contains in 1 kg 540 kcal of the heat and also heat transfer coefficients are high is diminishing the size of heatexchangers. When temperatures of the process are higher than 250-300°C high boiling heat carrier are used. The typical example is dowtherm or other highly aromatic fractions from refineries. The dowtherm is heated in special furnaces and than is used as heat carrier in the process. Equipment in this closed circuit is highly specialised.

Water is used for technological purposes or like cooling agent. Use of the water in the technological process requests it pre-preparation. Technology of the water preparation is rather standard and installat is composed from mechanical filters and anionic and cationic filter. Distilled water is used in special cases, because of high energy consumption in this process.

As a cooling agent water is used also after some preparation, filtration and some demineralisation. If it is used in closed circuits (cooling towers) than stations of biological treatment is necessary e.g. chlorination of circulating water. Water as cooling agent in closed circuits can be used only at low or medium humidity and temperatures not higher than 40°C.

In some cases air can be used as a cooling agent. Several models of the air-coolers are widely used in the petrochemical and refinery industry. For special purposes other cooling agents can be used e.g. ammonia, freons when temperatures of the process should be kept from 0-30°C and propane-ethane mixtures when temperatures below -70°C are requested. This kind of cooling agents is expensive and can be used in very sophisticated processes, when added value of the product is high.
To produce low temperature energy the primary electrical energy is used mainly for compression of the gases.

Compressed gases as air and nitrogen are used for mainly two purposes:
- as technological agent or safety antyexplosion blankets /nitrog
- as energy carrier in pneumatic systems of mechanisation or automation

Gas stations are equipped with compressors, coolers, condensers or/and drying filters. Compressors can be driven or by electrical energy or by diesel motors. The specially universal energy carrier and over all used utility is electricity. It is source of lightning and power and as we have seen any of other utilities would be useless without the electric power.

There are several standard tensions at which electroenergy is used:
- for lighting; 110 V, 220-250V /also for small motors/
- as power resource the 500-600V, and for the high power motors also 6000V tension is used.

Therefore the circuits of electrical energy are complicated at any factory. They should be equipped in transformer of tension, special bloende systems switchboards of different size and capacity, and control systems.

Installed power is measured in KVA which includes both the resistive and reactive energy. Power factor is the coefficient to calculate the resistive component of energy K\text{W}, which is the sum of power in K\text{W} of all motors in factory. Of course not all the motors installed are working simultaneously and this is expressed by the coefficient of the load factor. From this informations we can calculate the power which should be connected to the factory. In some countries this figure is reason fo the taxation, independently if energy is used or not. Consumption of the energy depends on time factor. Therefore to estimate the bill of energy quantity of hours of motors exploitation should be defined and quantity of KWh calculated.
Utilities

Raw materials

Auxiliary materials
Factory supplies
By-products

Model of materials and inputs transformations in the production process.
Time dependent properties of the raw materials
Economical variables

Logistic variables

Technical variables

Availability analysis of raw materials

Cost determinants

Suppliers, monopoly positions

User organization

Joint-venture possibility

Seasonal opportunity cost

Storage standards and methods

Monopoly of transport means

Transportation facilities

Yield of product

Deposits, reserves, status of definition
Considerations

Production programme
Localisation of suppliers
Transportation means
Time delivery schedule
Storage capacity
Economical order quantity
Special transportation and storage requirements

Technical and economical calculation

Supply programme

Supply programme considerations
Chapter V  Materials and inputs supply

Determination of the materials and other utilities quantities for the acrylic resin suspension production process.

1. Key words: Acrylic resin suspension - water

suspension of solid copolymer /latex/ of the concentration 40% used in paint industry.

2. Technological recipe of process.

<table>
<thead>
<tr>
<th>Item</th>
<th>Units</th>
<th>Input per charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEAA</td>
<td>Kg</td>
<td>1.000</td>
</tr>
<tr>
<td>Styrene</td>
<td>Kg</td>
<td>614</td>
</tr>
<tr>
<td>AA</td>
<td>Kg</td>
<td>100</td>
</tr>
<tr>
<td>AN</td>
<td>Kg</td>
<td>200</td>
</tr>
<tr>
<td>Water</td>
<td>Kg</td>
<td>3.000</td>
</tr>
<tr>
<td>Emulsifier</td>
<td>Kg</td>
<td>100</td>
</tr>
<tr>
<td>Catalyst</td>
<td>Kg</td>
<td>6</td>
</tr>
<tr>
<td>Salts</td>
<td>Kg</td>
<td>20</td>
</tr>
</tbody>
</table>

Copolymer yield 90%

Process is carried out in 7 m³ reactor equipped with stirrer, heating cooling coil.

Process parameters:

- Raw materials temperature 20°C
- Temperature of process 70°C
- Heat of reaction 330 kcal/kg
- Latex temperature 20°C

Motor power: N = 12 KW

Time of the reaction: 5 h

Stripping nonomer under vacuum: 1 h
Utilities consumption at stripping:

160 kg of 1.2 MPa steam and 24 m$^3$ cooling water of 16$^0$ C.

Loading, unloading, cleaning 2 h

3. Exercise

Calculate required quantities of the materials and utilities per 1 year of production. Insert the results into schedule 4-1/page 73. Calculate the cost of materials and utilities.

Exercise N3

<table>
<thead>
<tr>
<th>Item</th>
<th>Units</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEAA</td>
<td>M.u./kg</td>
<td>1.500</td>
</tr>
<tr>
<td>Styrene</td>
<td>M.u./kg</td>
<td>1.000</td>
</tr>
<tr>
<td>AA</td>
<td>M.u./kg</td>
<td>1.200</td>
</tr>
<tr>
<td>AN</td>
<td>M.u./kg</td>
<td>1.000</td>
</tr>
<tr>
<td>Deionised water</td>
<td>M.u./m$^3$</td>
<td>150</td>
</tr>
<tr>
<td>Emulsifier</td>
<td>M.u./kg</td>
<td>10</td>
</tr>
<tr>
<td>Catalyst</td>
<td>M.u./kg</td>
<td>100</td>
</tr>
<tr>
<td>Salts</td>
<td>M.u./kg</td>
<td>5</td>
</tr>
<tr>
<td>Cooling water</td>
<td>M.u./m$^3$</td>
<td>15</td>
</tr>
<tr>
<td>Steam</td>
<td>M.u./Mg</td>
<td>50</td>
</tr>
<tr>
<td>Power</td>
<td>M.u./MWh</td>
<td>77</td>
</tr>
</tbody>
</table>
Chapter VI. Technology. Technology transfer.

Lecture content:

1. Technology definition. 1/
2. Technology classification2/ and application conditions
3. Strategies of technology transfer
4. Degrees of technology acquisition
5. Results of different procedures of technology transfer
6. Model of the process adaptation
7. Special cases of trade-offs in the process adaptation.
8. What is to be licensed?
9. List of technology transfer documents
10. Expected risk reduction and profit expectations at different contract models.

Comments:

1/ Every activity is realized by special means. If we are repeating the same activity using the same means this can be called a method of activity execution. When methods are based on scientific results than methodology has been developed. Technology is the methodology to conditions of the input of the flow transformation to the requested product. Technological process transforms substances or their shape with the application of the physical, chemical and other rules and laws in certain region of parameters and variables, using standard or specialized technical structure. The technical structure may by part of the technology in the cases when is specifically attached to the transformation process. In most cases however the equipment and machinery serve as the environment to the technological process, and their particular source selection is secondary with aspect to technology.

Every technological process is characterised by its parameters like parameters like pressure, temperature, size, concentration, sequence of elementary actions etc., and the specific recipes or prescriptions are countless. But in every case action of those parameters can be integrated to the several intensive properties like consumption of the energy, consumption of the labor, consumption of the materials, and consumption of the capital /total fixed capital/.
2/ The classification of the technologies can be made in branches of industries, or by means used in the production process. But for decision maker this classification is useless. When the process of the selection of the technology starts than we should use classification of its applicability to the given project. From this point of view qualitative definitions are used:

- frontier technology
- advanced technology
- mature technology
- obsolete technology
- primitive technology

The frontier technology is such a process which brings not only the highest reward to the investment, but normally uses unique materials specially trained people, and needs very developed infrastructure in the inputs and specialized equipment. Normally is exercised in one or very few countries. The examples are: space technology, aviation, electronics, special chemical products like low tonnage plastics, pharmaceuticals, pesticides, etc.

Advanced technology is less sophisticated and during the modernization of existing technologies is being permanently developed to meet the competition of the market. Realization is much more easy and universally available materials are used as well rather standard equipment. Only skill of the management and workers is high and permanent research is carried out and improvements, continuously are being introduced. The examples are: motor car industry, high tonnage plastics, shipbuilding industry, cosmetics and detergents etc.

The mature technology has been utilized in many places at different climatic and economical conditions in different sizes of output and be easily tailored to practically any request of the customer. If using standard equipment and if special machinery is necessary it could be produced in many machineshops or factories over the world. The examples are: fertilizers, anorganic products, standard housing equipment, furniture, standard machinery and equipment, some petrochemicals etc.

Obsolet technology is the realisation of the old engineering concepts and in most cases is characterised by the low capacity, low yields of the final product, large quantity of the effluents and many industrial hazards in plant operation. Mostly it uses manpower in extensive way in unacceptable conditions. The examples are: marton steel furnaces old machineshops, coke industry etc.
3/ To make any choice of the technology we have to be equipped with some specific measurable parameters, which allow to compare different production processes and can assure at last to establish order of the priority of the different technological processes.

As we have mentioned before there are four main properties of each technology which are in the most cases substitute one to another. For every specific process it could be some trade off between the consumption of the materials, energy, labor and capital.

Comparison between different proposals or self developed processes should be made taking into account real internal trade off between those properties of the process. Measure of trade off can be made or in monetary terms or in physical terms /e.g. materials versus energy/. 
Chapter VII

Technology selection

Comparison of the semicontinuous and continuous bleaching of fats and oils.

1/ Key words: Bleaching - sequence of unit operations removing some colouring impurities from fats or oils

Fats and oils - glyceride esters of fatty acids C₁₄ - C₂₂

/mostly C₁₂ - C₁₅/

Semicontinuous process - Limited time continuous flow of inputs and at last one of the output, followed by the nonproductive/service/operation.

Continuous process - Permanent flow of inputs and outputs

2/ Technologies description

A - technology - semicontinuous bleaching of the almond /peanut/oil

Fig. N1

The oil is pumped to kettle equipped with stirrer and heating coil and than bleaching earth/or activated carbon/ is added. After one hour of mixing oil with earth, suspension is pumped through filter press, from which pure oil is obtained. Bleaching earth is recovered from filter after termination of the operation.

B - technology - continuous bleaching of the almond oil.

Fig. N2

The oil and bleaching earth are continuously transferred to kettle equipped with stirrer and heating coil. Mixed suspension is pumped to rotary filter. Formed on the first vacuum section cake is washed with solvent and filtered on following sections. Dry cake is cut out from filter and transported to solids disposal. Solvent-oil mixture is pumped from separator to distillation unit.
Recovered oil is added to filtrate from first section of the filter and pure solvent is recycled to washing section of rotary filter.

3/ Process data for the alternatives at 100 MTPD capacity.

<table>
<thead>
<tr>
<th>Items consumed</th>
<th>Units</th>
<th>semicont. Process</th>
<th>cont.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil losses</td>
<td>Kg</td>
<td>1.600</td>
<td>160</td>
</tr>
<tr>
<td>Bleaching earth</td>
<td>Kg</td>
<td>2.000</td>
<td>1.600</td>
</tr>
<tr>
<td>Solvent losses</td>
<td>Kg</td>
<td>-</td>
<td>300</td>
</tr>
<tr>
<td>Steam</td>
<td>Kg</td>
<td>9.000</td>
<td>19.000</td>
</tr>
<tr>
<td>Power</td>
<td>kWh</td>
<td>650</td>
<td>950</td>
</tr>
<tr>
<td>Water</td>
<td>l</td>
<td>600</td>
<td>1.600</td>
</tr>
<tr>
<td>Man-hours</td>
<td>h</td>
<td>96</td>
<td>48</td>
</tr>
</tbody>
</table>

Price list of items is attached to the exercise.

4. Exercise

Compare the processes costs of the operation. Determine condition for equipment cost increment at which continuous process is an appropriate technology. Semicontinuous process investment expenditures has been evaluated and figure $0.510^3 \text{ M.u/m}^3h$ was accepted for the project. If the semicontinuous process was previously implement what possible solutions are to be investigated?

Exercise N1

<table>
<thead>
<tr>
<th>Items</th>
<th>Units</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>M.u/Mg</td>
<td>1.800</td>
</tr>
<tr>
<td>Bleaching earth</td>
<td>M.u/Mg</td>
<td>800</td>
</tr>
<tr>
<td>Solvent</td>
<td>M.u/Mg</td>
<td>600</td>
</tr>
<tr>
<td>Steam</td>
<td>M.u/Mg</td>
<td>50</td>
</tr>
<tr>
<td>Power</td>
<td>M.u/MWh</td>
<td>77</td>
</tr>
<tr>
<td>Water</td>
<td>M.u/10^{-3}m^3</td>
<td>15</td>
</tr>
<tr>
<td>Manhour</td>
<td>M.u/h</td>
<td>5</td>
</tr>
</tbody>
</table>
Exercise N1

Fig. N.2. Flowsheet of continuous process.

<table>
<thead>
<tr>
<th>Item N</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tank</td>
</tr>
<tr>
<td>2</td>
<td>Pump</td>
</tr>
<tr>
<td>3</td>
<td>Kettle</td>
</tr>
<tr>
<td>4</td>
<td>Rotary filter</td>
</tr>
<tr>
<td>5</td>
<td>Cooler</td>
</tr>
<tr>
<td>6</td>
<td>Vacuum pump</td>
</tr>
<tr>
<td>7</td>
<td>Vessel</td>
</tr>
<tr>
<td>8</td>
<td>Pump</td>
</tr>
<tr>
<td>9</td>
<td>Tank</td>
</tr>
<tr>
<td>10</td>
<td>Vessel</td>
</tr>
<tr>
<td>11</td>
<td>Pump</td>
</tr>
<tr>
<td>12</td>
<td>Heat exchanger</td>
</tr>
<tr>
<td>13</td>
<td>Distillation column</td>
</tr>
<tr>
<td>14</td>
<td>Heater</td>
</tr>
<tr>
<td>15</td>
<td>Vessel</td>
</tr>
<tr>
<td>16</td>
<td>Pump</td>
</tr>
<tr>
<td>17</td>
<td>Pump</td>
</tr>
</tbody>
</table>
**Exercise N1**

**Fig N1. Flowsheet of semicontinuous process.**

**Equipment list**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tank</td>
</tr>
<tr>
<td>2</td>
<td>Pump</td>
</tr>
<tr>
<td>3</td>
<td>Kettle</td>
</tr>
<tr>
<td>4</td>
<td>Filter press</td>
</tr>
<tr>
<td>5</td>
<td>Tank</td>
</tr>
</tbody>
</table>
## Technology Selection

### Considerations

<table>
<thead>
<tr>
<th>Technology</th>
<th>Evaluat factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>raw materials availability/inventory cost</td>
<td>Q</td>
</tr>
<tr>
<td>% of the foreign components and sources of acquisition/how many producers</td>
<td>E</td>
</tr>
<tr>
<td>quality and shape compatibility of the product with internal requirements/measures</td>
<td>Q</td>
</tr>
<tr>
<td>elasticity of the production programme</td>
<td>Q</td>
</tr>
<tr>
<td>source of the technology and its supporting portfolio (patents, trade marks)</td>
<td>Q</td>
</tr>
<tr>
<td>terms of licensing agreement</td>
<td>Q</td>
</tr>
<tr>
<td>competitive cost of the technology (?)</td>
<td>Q</td>
</tr>
<tr>
<td>infrastructural compatibility</td>
<td>Q</td>
</tr>
<tr>
<td>capability of the user to absorb and use technology</td>
<td>Q</td>
</tr>
<tr>
<td>economical considerations/investment production costs, NPV, ROI</td>
<td>E</td>
</tr>
<tr>
<td>local versus foreign alternatives</td>
<td>E</td>
</tr>
<tr>
<td>technical considerations</td>
<td>Q</td>
</tr>
<tr>
<td>production schedule/elasticity/</td>
<td></td>
</tr>
<tr>
<td>dependence of the technology on critical equipment</td>
<td></td>
</tr>
<tr>
<td>lower upper limits of operational capacity</td>
<td></td>
</tr>
<tr>
<td>pollution</td>
<td></td>
</tr>
<tr>
<td>level of automation and mechanization</td>
<td>Q = qualitative appraisal</td>
</tr>
</tbody>
</table>
Comparison of the qualitative parameters of technology

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Weight factor %</th>
<th>Qualification alternatives /points/</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>I 3 0.3 II 2 0.2 III 3 0.3</td>
</tr>
<tr>
<td>B</td>
<td>20</td>
<td>I 2 0.4 II 3 0.6 III 2 0.4</td>
</tr>
<tr>
<td>C</td>
<td>50</td>
<td>I 1 0.5 II 2 1.0 III 3 1.5</td>
</tr>
<tr>
<td>D</td>
<td>20</td>
<td>I 2 0.4 II 1 0.2 III 1 0.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Case</th>
<th>Weight factor %</th>
<th>Qualification alternatives /points/</th>
</tr>
</thead>
<tbody>
<tr>
<td>elasticity</td>
<td>15</td>
<td>I 3 0.45 II 1 0.15 III 2 0.3</td>
</tr>
<tr>
<td>source of gas</td>
<td>10</td>
<td>I 3 0.3 II 1 0.1 III 2 0.6</td>
</tr>
<tr>
<td>capability of absorption</td>
<td>25</td>
<td>I 3 0.75 II 2.05 III 2 0.5</td>
</tr>
<tr>
<td>dependence on c.e.</td>
<td>35</td>
<td>I 3 1.05 II 1 0.35 III 3 1.05</td>
</tr>
<tr>
<td>pollution</td>
<td>10</td>
<td>I 3 0.3 II 1 0.1 III 2 0.2</td>
</tr>
<tr>
<td>level of cont. and med.</td>
<td>5</td>
<td>I 1 0.05 II 3 0.15 III 2 0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I 2.9 II 1.35 III 2.25</td>
</tr>
</tbody>
</table>
Chapter IX. Project engineering.

Lecture content:

1. Production planning objectives
3. Function and structure compatibility for unit operations
4. Process and Instrumentation flow-sheet of unit operations
5. Parametrisation of process flow
6. Hierarchy of technical and economical parameters and variables describing the production process
7. System analysis of the technical structure of the production process
8. Procedure of the equipment selection.
9. Investment cost estimate.
10. Preliminary project /project charts and layouts/1

Comments:

1/ Once technology has been selected or at least alternative solutions are known it is necessary to define the main and auxiliary equipment. Sometimes it is very easy task because equipment used in the process is standard. This is the case for most machineries. When specialized equipment is to be used a special preliminary design it is necessary. In some cases technology and equipment are so inter-dependent that selection of the technology automatically define the equipment.

What is necessary to specify equipment or to prepare order for bids?

- Material and energy balance of the technological process.

While the production programme is defined plant capacity preliminary estimated, materials and inputs calculated and technology selected, balance of the flows through the different process units is a problem with which every process engineer can deal. Practically balance preparation is solution of the several to several hundreds of equations including process parameters and flow properties.

- Preliminary flowcharts of the technological process should be prepared.
Some information is given in the basic engineering or in bids of the technology supplier. Using the data from material and energy balance and process information Process and Instrumentation P. I. charts should be prepared.

Then we will have the complex look on all interconnections between the unit process equipment and all additional points of the flows will be identified. Indications on the instrumentation and control points are to be discussed because at this moment the manpower is decided in quantity and skill.

- balancing of the equipment capacities

Identification of each unit process on the P I diagram and material balance are giving the possibility to calculate the each process unit capacity. Calculations are made on the basis of the engineering manuals or on the basis of the informations from the catalogues or specification lists of the equipment producers. Choice of the equipment is to be made keeping the proper capacity proportions between the all items of the production process.

Selected equipment has to be specified on special check lists which are source for further calculation of the equipment cost. The typical check list is given in the MANUAL /p. 119 English edition/.

Procedure of the purchasing of the equipment and its cost estimate on the basis of the data in the offers or quotations of the producers will be discussed later.

Process functional charts.

Technological process defined on the P I diagram and dimensions of the every piece of the equipment given in the specifications, allow to prepare layouts of the equipment in the three dimensional space. This plant layout must follow several rules:

- location of the equipment is to be concize with the material flow,
- place for transport routes, local storages of processed materials, control and instrumentation rooms and necessary rest rooms for the workers has to be provided
- proper proportion between the working surface and many-level flooring is to be kept /cost of the land energy is to be considered/
General functional layout.

All the equipment and machinery are to be placed in production areas which could be buildings or open-air structures. Division of the process into several blocks depends mostly on the process requirements and organisation and management system in the factory. Sometimes the physical constraints are the obstacles to put all the equipment into one building. All the auxiliary buildings and structures are to be defined and properly placed on the site. All kinds of the buildings are to be considered:

- factory production buildings and structures
- ancillary buildings (maintenance workshops, garages, research and control laboratories, medical service building, factory, restaurants etc.)
- stores and warehouses (raw materials, auxiliary materials, finished products)
- welfare buildings
- administrative buildings
- hostels and eventual residential buildings

Transport layouts.

All the transport routes of the materials and products has to be investigated and proper roads, tunnels, bridges, railroad and truck loading stations designed with the connection to existing public facilities.

Utility layouts and diagrams.

Machinery and equipment specification shows the necessary quality and quantity of the utilities. Then the total consumption and supply as well as distribution points can be drawn. This source of information serves to design the all lines of distribution of the utilities, as well allows the dimensioning of pipes, cables and structures.

Telecommunication layouts.

Every process demands the central control and collection of the information as well the interprocess communication. Therefore layouts for the telephone wiring and distribution are necessary.
Sometimes two parallel telephone systems should exist/control to supervise process and external to communicate with the factory administration. Computer centres, printing and reproduction facilities as well as the telex centre should be designed.

Manpower and staffing of the factory.

Charts of manpower requirement and skill description with indications to training programme, and staff estimation is to be prepared. Methods of manpower estimation will be discussed later.

Organisational layouts.

Organigrams showing the organizational set up for the operation of the factory are to be prepared. This should be supported by the regulations and obligations as well responsibility prescriptions. Because organization of the operating factory is different also the organization during the engineering and erection time is to be proposed as well during the start up period. From every layout the necessary equipment and materials should be defined and specification charts should be prepared. This would serve to establish or control the cost of the civil works and will allow to place orders at the proper time.

Civil engineering works.

Already collected information allows the analysis of the civil engineering works which are necessary for the factory erection. Additional data are collected from the localisation and site description.

Three kinds of civil engineering works are to be estimated:

- site preparation and development
  The volume on check list is given in the manual /P. 120/

Calculation of the cost is made on the estimation basis of the physical volume of each kind of jobs, and prices dominating in the country or region. The tenders from the contractors should be sought giving them site data and appropriate layouts and charts.

- buildings and civil works.
  The check list is given in the manual /P. 120/

The procedure of the volume and cost estimate as above is to be applied

- outdoor civil works
  The check list is given in the manual /P. 121/

The procedure of the volume and cost estimate as above is to be applied.
Engineering design objectives.

- to define parameters and variables of the process
- to define dimensions, size, weight of machinery and equipment
- to define space allocation of structural elements
- to define volume, schedule of civil works
- to define interconnections inside and with environment
- to define inputs consumption
- to define investment cost, production cost
Feasibility study (functions definition e.g. technology)

Design and engineering (structure definition e.g. techniques of production)

Implementation and production supervision

Problem identification

Problem analysis

System synthesis

System analysis

Optimisation

Decision

Control of the solution

Procedure and stages of project development.
Chapter X Manpower Training.

Lecture content:

1. Estimation of working time a/ per year b/ per shift
2. Estimation of working places quantity
3. Coordination of the operation time and working time
4. Indirect labour
5. Working schedules
7. Organization chart of the installation, plant, company General principles.
8. Staff and managerial forces
10. Training programme

Comments:

1/ Estimation of the quantity of the labor and their skill should be a result of the production process analysis. Direct application of information concerning the manning the process from other countries is leading to erroneous decisions, because of different organization of the industry as a whole /e.g. service system/. Some help in the labor estimation could be:

- equipment supplies
- output data from other factories in the country

The best solution for the labor estimate is the analysis of the working places. To the working place is attached permanent function fullfilled by the operation on the place, or in the several places, covering his scheduled time of work. On the working place operator is in the contact directly or indirectly with the flow of the materials and the machinery or equipment. It means that only analysing the P I diagram and layouts of the equipment one can define the quantity and quality of the labor. The procedure of the estimation is as follows:

- define the places on the P I diagram where the participation of the worker is anticipated
- estimate the time necessary to service the equipment or flow of the materials
- add auxiliary activities
- count the quantity of the labor on the every working place
- add the control operation and time
- estimate direct supervisory manning
- add the personnel in control rooms or at steering panels
- define the capabilities and knowledge to service each working place

Result should be the direct labor specification in the given section or department of the factory.

In some factories above the direct working place attached personnel it is necessary to follow periodically the performance of the some specialised machinery which is selfcontrolled, but needs some supervision on the mechanical side /like compressors, pumps, hydraulic pressure facilities/. Than the route of the controlled places is to be established and routine circulation personnel is to be assessed. This personnel may to be obliged to execute simple maintenance like greasing, liquidation of the small leakages etc. It is necessary to establish control timers for this personnel, or other way of reporting.

2/ Additionally to the direct production personnel is to be defined on the basis of the functions of each service section:
- store and warehouses personnel /on the basis of time schedule of the activity/
- maintenance machinshops personnel and specialized maintenance personnel
- water, electricity, effluences and other utilities service personnel
- automation and instrumentation section personnel

Quantity and skill has to be defined on the basis of layouts and diagrams of the utility distribution and the proceedings of the timing.

3/ Salaries are to be established in two models:
- monthly salary for the clerical, managerial, and supervisory personnel
- hourly pay for the most of the workers