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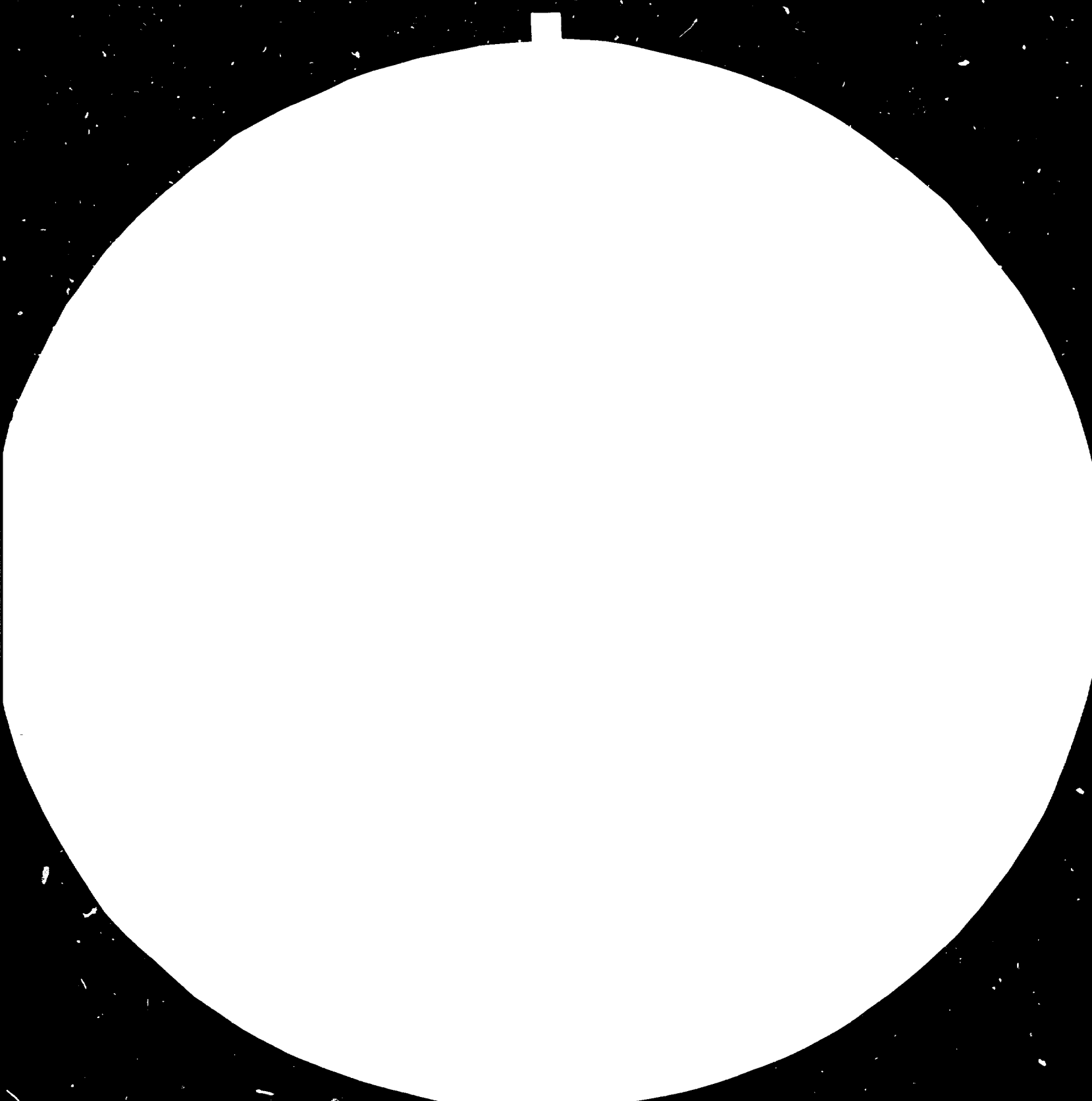

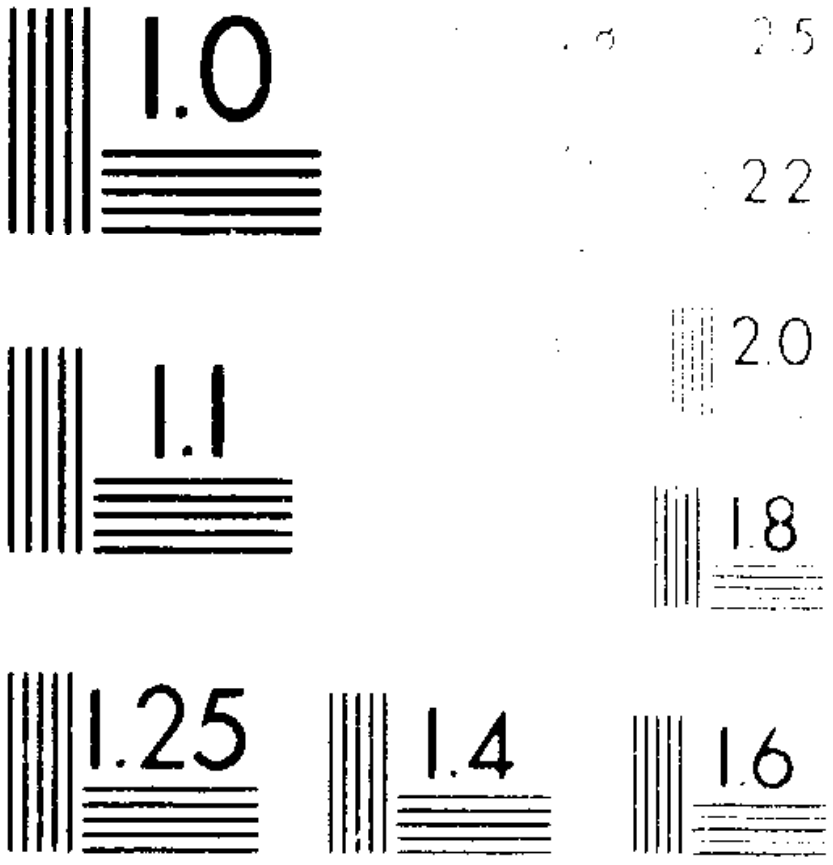
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Original: English

Cuba.

TERMINAL REPORT

OF

THE UNIDO TEAM OF CONSULTANTS

TO THE TRAINING SEMINAR ON

PREPARATION, EVALUATION AND FINANCING

OF INDUSTRIAL PROJECTS

IN HAVANA, CUBA

MAY 1984

Prepared by UNIDO consultants
W. Hübner, O. Heinonen, T. Ocfaly

United Nations Industrial Development Organization, Vienna

This report has not been cleared with the United Nations Industrial Development Organization, which does not therefore, necessarily share the views presented.

1984

from: M. Kukczycki

Training Seminar on

PREPARATION, EVALUATION AND FINANCING

of Industrial Projects

T E R M I N A L R E P O R T

I. Official Arrangement and Contributors

The training Seminar on Industrial Project Preparation, Evaluation and Financing was sponsored and organized under the joint-auspices of the United Nations Industrial Development Organization in Vienna, the United Nations Development Programme in Havana and the "Comision De Asociaciones Economicas" of Cuba. The lecturers to the workshop seminar were: Messr. O. Heinonen, W. Hübner and T. Gefaly from UNIDO part and Messr. J. Pacheco and L. Penichet from the Cuban part.

The Government of Cuba nominated 33 participants of senior level from 17 different Ministries and Institutions engaged in industrial projects development. A cross-section of the participants profession is as follow:

Engineers:	10
Engineer-Economist:	2
Economists:	15
Accountant:	1
Foreign Trade spec.:	1
Unspecified:	4
Total:	33

Annexe I presents a list of participants, their field of specialization and the respective institution they are working for.

II. Objectives of the seminar

The main objectives of the seminar were to up-grade the skills of senior personnel in different Ministries and Cuban Institutions in the field of project preparation, evaluation and financing by:

- Presenting and explaining the proven methodology applied by UNIDO in project formulation;

- Training the participants by applying "Case Study".

III. Organization and scope of the seminar

UNIDO consultants arrived on friday April 13 in Havana. On saturday April 14 a meeting was held with the Cuban responsibles to plan and organize the start-up of the seminar. A programme schedule was prepared by the consultants and presented to the Cuban responsibles for discussion. Consequently, an initial schedule was established. However, some modifications were introduced during the programme to accomodate different factors affecting the schedule. Annexe II presents the programme schedule as implemented.

The workshop seminar started on April 16, 1984 and was concluded on friday May 4. Lecturing time was on the basis of 2 morning sessions of 1 1/2 hours each and one afternoon session of 2 hours for a daily total of 5 hours excluding coffee-break and lunch time. In addition, saturday April 21 was included as a lecturing day in lieu of tuesday May 1 which was an official holiday. In total, 43 lecturing sessions were held (excluding opening and closing ceremonies) totaling 71 1/2 hours.

Repartition of lecturing time on the main topics were as follow:

	No. sessions	No. of hours	% of time
1. Outline of project development cycle	4	7	10%
2. Market study	10	16 1/2	23%
3. Technical analysis	7	11	15%
4. Financial evaluation and project financing	12 1/2	21	30%
5. Economic evaluation	7 1/2	13	18%
6. COMFAR presentation and seminar evaluation	2	3	4%
Total:	43	71 1/2	100%

The seminar was held in a conference room of the Havana Libre Hotel. The services of 3 competent interpreters was made available at all time, securing fast and instantaneous translation. The workshop was conducted by presenting the topic in a lecture fashion mixed with life examples. After presenting the conceptual approach, case studies were introduced as an exercise to the group on the subject presented.

Concerning the market study and the economic evaluation, several cases were introduced, as for the financial analysis, the case study of "Magera fruit processing project" was the basic practical application of the methodology in project evaluation.

For the purpose of applying "case study", the participants were divided into 4 groups headed by 4 team leaders to present the results of each group work. Part of the sessions were used for the practical application by the participants to exercise on the "case study". They were asked to calculate and/or evaluate the data obtained from different tables of the case study. Homework on case study was not favored by the participants as a result of their other obligations.

The participants were given the following items:

- a calculator
- the manual for the preparation of industrial feasibility studies
- the manual for the evaluation of industrial projects
- the guidelines for project evaluation
- the guide to practical project appraisal.

In addition to the above, discounting tables were provided from the consultants to the participants - Annexe III -. In addition to the above, each of the consultant prepared fairly extensive handouts on their respective areas of analysis. These handouts were given to the participants and were supplementary material, delivering conceptual as well as practical aspects on the topic presented. A volume containing this additional material is attached to this report in Annexe IV.

Finally, the consultants together with Mr. Kulczycki of UNIDO, Vienna, went to Cuba 9, where a pilot project producing experimental newsprint from bagasse, is already in existence. There, discussion between Mr. Lopez Guzman and Mr. Kulczycki and the consultants were held to establish the follow-up on a pre-feasibility study for the full scale production of a new factory producing newsprint from bagasse.

IV. Evaluation of the seminar

The participants had different background as well as different level of experience. Thus, the lecturers had to adjust their lecturing speed so as not to loose the interest of the experienced group or run the risk to loose the comprehension of the less experienced group. In regards to selecting candidates for similar courses in the future, it is recommended to choose a homogeneous group.

At any time during the sessions, and several times after the sessions, participants were free to raise questions to clarify obscure side of the subject. This created a two ways dialogue helping to maintain the interest and clarifying vague items. Moreover, the consultants kept the interest of the participants by asking them to respond to the lecture questions put during the session and also requested the groups to contribute by verbal presentation on their findings of the "case study" applied.

Attendance to the seminar was at all time above 90% of the total number of registered participants. The main cause of absentism from the seminar was the calls made on some of the participants by their respective institution. A list of presence was kept up-to-date daily.

The language communication gap presented no difficulty at all, as most of the participants understood fairly well the english language and the exceptionally rapid and accurate translation of the interpreters complemented whatever was missed by the participants.

From the questions raised and responses received from the participants and from the discussions held and the practical exercises done, it is clear that within the time limit of the seminar its basic objectives were attained, as:

- the programme has been fully covered,
- case studies were carried out on each topic of a feasibility study,
- additional practical life examples were given.

The great assistance provided by the Cuban responsibles in providing all the necessary logistic support (typing facilities, photocopying, blackboard, projector, interpreters, etc.) has greatly contributed to the attainment of the seminar objectives.

The duration of the seminar was considered by several participants as short, considering the load of knowledge presented and its assimilation by applying "case study".

It could be quite beneficial if a case study from the country itself be prepared before the start-up of the seminar and thereafter presented during the seminar.

Finally, each participant who attended more than 80% of the seminar time was given a certificate for having followed the course. The certificates were remitted at the closing ceremony by Mr. Bravo Lopez of the Council of Minister Secretariat.

V. Recommendations

- A Case Study proper to the country would be an ideal way to present it as it would fit the local environment. This case study would include all the facets of a feasibility study. This case would be presented as an exercise during the seminar.

- A brief evaluation by the participants at the end of each topic presented is recommended and not merely at the end of the programme. This could help redirect the programme according to the local needs and conditions and not reflecting the results at the end of the seminar when usually it is too late.

- Follow-up procedure to establish further development and training to the local experts.

- To select participants with similar level of preparation and experience so that the presentation of the lecturer be more uniformaly comprehended.

VI. Acknowledgement

The UNIDO team is grateful to the "Comision De Asociaciones Economicas" of Cuba for all the facilities and arrangements provided which greatly contributed to the success of the seminar. Also, special thanks are due to all the Cuban responsibles who directly or indirectly contributed to the successfull conclusion of this seminar.

The team also wishes to express their deep appreciation and thanks to the Resident Representative, his deputy and the JPO for their great assistance and help and for their contribution to its success.

Finally, the consultants present their thanks to Mr. W. Behrens, chief of the Feasibility Studies Section and Mr. M. Kulczycki at UNIDO headquarters in Vienna, who organized this seminar and have through their assistance supervision and guidance contributed to its success and attainment of its objectives.

W. HÜBNER

O. HEINONEN

T. ORFALY

SEMINARIO ONUDI

RELACION DE PARTICIPANTES

NOMBRE	CALIFICACION	ORGANISMOS
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Raúl Tapia G.	Economista	Ministerio de la Industria Sidero-Mecánica
Marta Molina S.	Economista	Ministerio de Salud Pública
Lutgarda Durruthy	Economista	Ministerio de la Industria Alimenticia
Mario Sustegui	Economista	Ministerio de la Industria Ligera
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Asela Sardui Q.	Economista	Ministerio de la Construcción
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Migdalia Arias R.		
Gustavo Delgado H.	Ingeniero-Economista	Ministerio de la Industria Básica
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Gladys Blanco C.	Ingeniera	" " "
Maribel Herryman M.	Ingeniera	" " "
Marianela Cordovés H.	Ingeniera	" " "

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Carlos Salomón	
Juan Molina	
Ma.Consuelo Fernández	
Lázaro Rodríguez P.	Contador
David Muñoz F.	Economista
Angel García F.	Economista
Mayra García T.	Economista
Rolando Casamayor L.	Ingeniero

16.4.84

ORGANISMOS

Ministerio del Transporte
" " "

Junta Central de Planificación
" " "
" " "
" " "
" " "
" " "

Instituto Nacional de Turismo
" " "
" " "

Banco Nacional de Cuba

Instituto Nacional de Sistemas Automatizados y Técnica de Computación

ANNEXE II

PROGRAMME SCHEDULE

TRAINING SEMINAR FOR INDUSTRIAL PROJECT PREPARATION, EVALUATION AND FINANCING

APRIL 16 - TO MAY 4, 1984 - HAVANA, CUBA

DAY	DATE	TIME	SUBJECT	Lecturer
Monday	April 16	9.00 - 9.45	Opening Ceremony	
		10.15 - 12.15	Course Orientation & Project Cycle	Orfaly
		14.30 - 16.30	Project Identification/pre-investment stages	Orfaly
Tuesday	April 17	9.00 - 10.30	Introduction to industrial project preparation, evaluation and financing	Orfaly
		11.00 - 12.30	Project background	Orfaly
		14.30 - 16.30	Time value of money concept	Orfaly
Wednesday	April 18	9.00 - 10.30	Market study - Introduction	Heinonen
		11.00 - 12.30	Market study - Case study	Heinonen
		14.30 - 16.30	Market study - Data collection	Heinonen

.../2

10.30 - 11.00 Coffee Break

ANNEXE II

PROGRAMME SCHEDULE

TRAINING SEMINAR FOR INDUSTRIAL PROJECT PREPARATION, EVALUATION AND FINANCING

APRIL 16 - TO MAY 4, 1984 - HAVANA, CUBA

DAY	DATE	TIME	SUBJECT	Lecturer
Thursday	April 19	9.00 - 10.30	Market study - Forecasting methods	Hübner
		11.00 - 12.30	Market study - Market strategy	Heinonen
		14.30 - 16.30	Market study - Market inputs	Heinonen
Friday	April 20	9.00 - 10.30	Market study - Pricing policies	Heinonen
		11.00 - 12.30	Market study - Pricing policies Forecasting methods	Heinonen Hübner
		14.30 - 16.30	Market study - Market share	Heinonen
Saturday	April 21	9.00 - 10.30	Production Programme	Penichet Pacheco
		10.45 - 12.15	Plant capacity	Pacheco
Monday	April 23	9.00 - 10.30	Project Engineering -Material & Inputs	Penichet
		11.00 - 12.30	Project Engineering, location & site, implementation schedule	Pacheco
		14.30 - 16.30	Material & Inputs, location & site, project engineering, implementation schedule	Pacheco Orfaly

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ANNEXE II

PROGRAMME SCHEDULE

TRAINING SEMINAR FOR INDUSTRIAL PROJECT PREPARATION, EVALUATION AND FINANCING

APRIL 16 - TO MAY 4, 1984 - HAVANA, CUBA

DAY	DATE	TIME	SUBJECT	Lecture
Tuesday	April 24	9.00 - 10.30	Market study - Market share, Marketing organization	Heinone
		11.00 - 12.30	Location & Site - Case study	Orfaly
		14.30 - 16.30	Amortization & depriaciation treatment. Definition of the financial statements	Orfaly
Wednesday	April 25	9.00 - 10.30	Technology choise-case study Plant organization & overhead costs, manpower	Orfaly
		11.00 - 12.30	Financial evaluation. Fixed investmentcost & preoperation capital expenditures CASE STUDY	Orfaly
		14.30 - 16.30	Financial Evaluation - Annual production cost and financial charges treatment/capital structure	Orfaly
Thursday	April 26	9.00 - 10.30	Financial Evaluation Working capital. Total investment cost	Orfaly
		11.00 - 12.30	Financial Evaluation - sources of initial funds CASE STUDY Income Statement	Orfaly
		14.30 - 16.30	Financial Evaluation Cash flow for financial planing	Orfaly
Friday	April 27	9.00 - 10.30	Financial Evaluation Balance sheet- Case study CASES STUDY	Orfaly
		11.00 - 12.30	Financial Evaluation - Cash flow to calculate the I.R.R.	Orfaly
		14.30 - 16.30	Financial Evaluation - Financial ratios - Profitability, liquidity, leverage, interest coverage & equity	Orfaly

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ANNEXE II

PROGRAMME SCHEDULE

TRAINING SEMINAR FOR INDUSTRIAL PROJECT PREPARATION, EVALUATION AND FINANCING

APRIL 16 - TO MAY 4, 1984 - HAVANA, CUBA

DAY	DATE	TIME	SUBJECT	Lecturer
Monday	April 30	9.00 - 10.30	Financial ratio application to measure projects' financial viability	Orfaly
		11.00 - 12.30	**Financing Sources** Computer simulation, risk analysis (B.E.P.-sensitivity-probability)	Orfaly
		14.30 - 16.30	Economic evaluation -Basic criteria for national benefit evaluation	Hûbner
Wednesday	May 2	9.00 - 10.30	Principles of social benefit cost analysis	Hûbner
		11.00 - 12.30	Value added concept	Hûbner
		14.30 - 16.30	Absolute/relative efficency test	Hûbner
Thursday	May 3	9.00 - 10.30	Shadow pricing - Introduction	Hûbner
		11.00 - 12.30	Shadow pricing- Presentation	Hûbner
		14.30 - 16.30	The effects methods - other approaches	Hûbner

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ANNEXE II

PROGRAMME SCHEDULE

TRAINING SEMINAR FOR INDUSTRIAL PROJECT PREPARATION, EVALUATION AND FINANCING

APRIL 16 - TO MAY 4, 1984 - HAVANA, CUBA

DAY	DATE	TIME	SUBJECT	Lecturer
Friday	May 4	9.00 - 10.30	Uncertainty and risk analysis Feasibility study programme review	Hübner Orfaly
		11.00 - 12.30	Pre-investment studies and UNIDO COMFAR computer application	Kulczycki
		14.30 - 16.00	Seminar evaluation and Open question period	Kulczycki
		16.00 - 16.30	Closing Ceremony	

Saturday May 5 7.30 - 15.00 Visit to Cuba 9 - re discussion on the pre-feasibility study on the newsprint project from bagasse

ANNEXE III

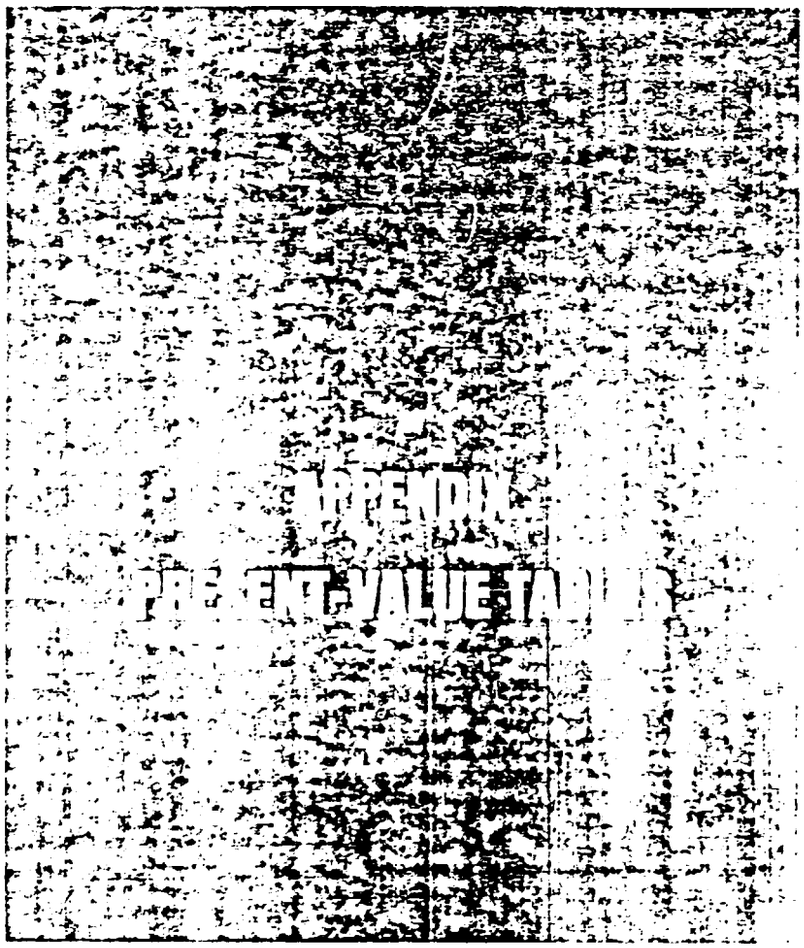


TABLE A 1

Present value of one dollar due at the end of n years

N	1%	2%	3%	4%	5%
01	0.99010	0.98039	0.97007	0.96154	0.95238
02	.98030	.96117	.94260	.92456	.90703
03	.97059	.94232	.91514	.88900	.86384
04	.96098	.92385	.88849	.85480	.82270
05	.95147	.90573	.86261	.82193	.78353
06	.94204	.88797	.83748	.79031	.74622
07	.93272	.87056	.81309	.75992	.71068
08	.92348	.85349	.78941	.73069	.67684
09	.91434	.83675	.76642	.70259	.64461
10	.90529	.82035	.74409	.67556	.61391
11	.89632	.80426	.72242	.64958	.58468
12	.88745	.78849	.70138	.62460	.55684
13	.87866	.77303	.68095	.60057	.53032
14	.86996	.75787	.66112	.57747	.50507
15	.86135	.74301	.64186	.55526	.48102
16	.85282	.72845	.62317	.53391	.45811
17	.84438	.71416	.60502	.51337	.43630
18	.83602	.70016	.58739	.49363	.41552
19	.82774	.68643	.57029	.47464	.39573
20	.81954	.67297	.55367	.45639	.37689
21	.81143	.65978	.53755	.43883	.35894
22	.80340	.64684	.52189	.42195	.34185
23	.79544	.63416	.50669	.40573	.32557
24	.78757	.62172	.49193	.39012	.31007
25	.77977	.60953	.47760	.37512	.29530

Source: Ezra Solomon, ed., *The Management of Corporate Capital* (New York: The Fr

6%	7%	8%	9%	10%	N
0.94340	0.93458	0.92593	0.91743	0.90909	01
.89000	.87344	.85734	.84168	.82645	02
.83962	.81630	.79383	.77218	.75131	03
.79209	.76290	.73503	.70843	.68301	04
.74726	.71299	.68058	.64993	.62092	05
.70496	.66634	.63017	.59627	.56447	06
.66506	.62275	.58349	.54703	.51316	07
.62741	.58201	.54027	.50187	.46651	08
.59190	.54393	.50025	.46043	.42410	09
.55839	.50835	.46319	.42241	.38554	10
.52679	.47509	.42888	.38753	.35049	11
.49697	.44401	.39711	.35553	.31863	12
.46884	.41496	.36770	.32618	.28966	13
.44230	.38782	.34046	.29925	.26333	14
.41726	.36245	.31524	.27454	.23939	15
.39365	.33873	.29189	.25187	.21763	16
.37136	.31657	.27027	.23107	.19784	17
.35034	.29586	.25025	.21199	.17986	18
.33051	.27651	.23171	.19449	.16351	19
.31180	.25842	.21455	.17843	.14864	20
.29415	.24151	.19866	.16370	.13513	21
.27750	.22571	.18394	.15018	.12285	22
.26180	.21095	.17031	.13778	.11168	23
.24698	.19715	.15770	.12640	.10153	24
.23300	.18425	.14602	.11597	.09230	25

e Press of Glencoe, Inc., 1959) pp. 313–16

TABLE A-1

Present value of one dollar due at the end of n years

N	11%	12%	13%	14%	15%
01	0.90090	0.89286	0.88496	0.87719	0.86957
02	.81162	.79719	.78315	.76947	.75614
03	.73119	.71178	.69305	.67497	.65752
04	.65873	.63552	.61332	.59208	.57175
05	.59345	.56743	.54276	.51937	.49718
06	.53464	.50663	.48032	.45559	.43233
07	.48166	.45235	.42506	.39964	.37594
08	.43393	.40388	.37616	.35056	.32690
09	.39092	.36061	.33288	.30751	.28426
10	.35218	.32197	.29459	.26974	.24718
11	.31728	.28748	.26070	.23662	.21494
12	.28584	.25667	.23071	.20756	.18691
13	.25751	.22917	.20416	.18207	.16253
14	.23199	.20462	.18068	.15971	.14133
15	.20900	.18270	.15989	.14010	.12289
16	.18829	.16312	.14150	.12289	.10686
17	.16963	.14564	.12522	.10780	.09293
18	.15282	.13004	.11081	.09456	.08080
19	.13768	.11611	.09806	.08295	.07026
20	.12403	.10367	.08678	.07276	.06110
21	.11174	.09256	.07680	.06383	.05313
22	.10067	.08264	.06796	.05599	.04620
23	.09069	.07379	.06014	.04911	.04017
24	.08170	.06588	.05322	.04308	.03493
25	.07361	.05882	.04710	.03779	.03038

16%	17%	18%	19%	20%	N
0 86207	0 85470	0 84746	0 84034	0 83333	01
.74316	.73051	.71818	.70616	.69444	02
.64066	.62437	.60863	.59342	.57870	03
.55229	.53365	.51579	.49867	.48225	04
.47611	.45611	.43711	.41905	.40188	05
.41044	.38984	.37043	.35214	.33490	06
.35383	.33320	.31392	.29592	.27908	07
.30503	.28478	.26604	.24867	.23257	08
.26295	.24340	.22546	.20897	.19381	09
.22668	.20804	.19106	.17560	.16151	10
.19542	.17781	.16192	.14756	.13459	11
.16846	.15197	.13722	.12400	.11216	12
.14523	.12989	.11629	.10420	.09346	13
.12520	.11102	.09855	.08757	.07789	14
.10793	.09489	.08352	.07359	.06491	15
.09304	.08110	.07078	.06184	.05409	16
.08021	.06932	.05998	.05196	.04507	17
.06914	.05925	.05083	.04367	.03756	18
.05961	.05064	.04308	.03669	.03130	19
.05139	.04328	.03651	.03084	.02608	20
.04430	.03699	.03094	.02591	.02174	21
.03819	.03162	.02622	.02179	.01811	22
.03292	.02702	.02222	.01830	.01509	23
.02838	.02310	.01883	.01538	.01258	24
.02447	.01974	.01596	.01292	.01048	25

TABLE A-1

Present value of one dollar due at the end of n years

N	21%	22%	23%	24%	25%	26%
01	0.82645	0.81967	0.81301	0.80645	0.80000	0.79365
02	.68301	.67186	.66098	.65036	.64000	.62988
03	.56447	.55071	.53738	.52449	.51200	.49991
04	.46651	.45140	.43690	.42297	.40960	.39675
05	.38554	.37000	.35520	.34111	.32768	.31488
06	.31863	.30328	.28878	.27509	.26214	.24991
07	.26333	.24859	.23478	.22184	.20972	.19834
08	.21763	.20376	.19088	.17891	.16777	.15741
09	.17986	.16702	.15519	.14428	.13422	.12493
10	.14864	.13690	.12617	.11635	.10737	.09915
11	.12285	.11221	.10258	.09383	.08590	.07869
12	.10153	.09198	.08339	.07567	.06872	.06245
13	.08391	.07539	.06780	.06103	.05498	.04957
14	.06934	.06180	.05512	.04921	.04198	.03934
15	.05731	.05065	.04481	.03969	.03518	.03122
16	.04736	.04152	.03643	.03201	.02815	.02478
17	.03914	.03403	.02962	.02581	.02252	.01967
18	.03235	.02789	.02408	.02082	.01801	.01561
19	.02673	.02286	.01958	.01679	.01441	.01239
20	.02209	.01874	.01592	.01354	.01153	.00983
21	.01826	.01536	.01294	.01092	.00922	.00780
22	.01509	.01259	.01052	.00880	.00738	.00619
23	.01247	.01032	.00855	.00710	.00590	.00491
24	.01031	.00846	.00695	.00573	.00472	.00390
25	.00852	.00693	.00565	.00462	.00378	.00310

27%	28%	29%	30%	N
0 78740	0 78125	0 77519	0 76923	01
.62000	61035	.60093	.59172	02
.48819	.47684	.46583	.45517	03
.38440	.37253	.36111	.35013	04
.30268	.29104	.27993	.26933	05
.23833	.22737	.21700	.20718	06
.18766	.17764	.16822	.15937	07
.14776	.13878	.13040	.12259	08
.11635	.10842	.10109	.09430	09
.09161	.08470	07836	.07254	10
07214	06617	06075	05580	11
05680	05170	04709	04292	12
.04472	04039	03650	.03302	13
.03522	03155	02830	02540	14
02773	.02465	.02194	.01954	15
02183	01926	01700	01503	16
01719	01505	01318	01156	17
01354	01175	01022	00889	18
01066	00918	00792	00684	19
00839	00717	00614	00526	20
.00661	00561	00476	00405	21
00520	00438	00369	00311	22
00410	00342	.00286	00239	23
.00323	.00267	.00222	00184	24
.00254	.00209	.00172	00142	25

TABLE A-1

Present value of one dollar due at the end of n years

N	31%	32%	33%	34%	35%
01	0.76336	0.75758	0.75188	0.74627	0.74074
02	58272	57392	56532	55692	54870
03	44482	43479	42505	41561	40644
04	33956	32939	31959	31016	30107
05	25920	24953	24029	23146	22301
06	19787	18904	18067	17273	16520
07	15104	14321	13584	12890	12237
08	11530	10849	10214	09620	09064
09	08802	08219	07680	07179	06711
10	06719	06227	05774	05357	04971
11	05129	04717	04341	03998	03683
12	03915	03574	03264	02984	02729
13	02989	02707	02454	02227	02021
14	02281	02051	01845	01662	01497
15	01742	01554	01387	01240	01109
16	01329	01177	01043	00925	00822
17	01015	00892	00784	00691	00609
18	00775	00676	00590	00515	00451
19	00591	00512	00443	00385	00334
20	00451	00388	00333	00287	00247
21	00345	00294	00251	00214	00183
22	00263	00223	00188	00160	00136
23	00201	00169	00142	00119	00101
24	00153	00128	00107	00089	00074
25	00117	00097	00080	00066	00055

36°₀	37°₀	38°₀	39°₀	40°₀	N
0 73529	0 72993	0 72384	0 71942	0 71429	01
54066	53279	52510	51757	51020	02
39754	38890	38051	37235	36443	03
29231	28367	27573	26788	26031	04
21493	20720	19980	19272	18593	05
15804	15174	14579	13965	13381	06
11621	11040	10492	09975	09486	07
08545	08058	07603	07176	06776	08
06283	05902	05502	05163	04840	09
04620	04293	03987	03704	03442	10
03397	03134	02891	02667	02460	11
02497	02302	02096	01922	01764	12
01837	01690	01519	01383	01259	13
01350	01219	01101	00995	00900	14
00993	00890	00798	00716	00643	15
00730	00649	00578	00515	00459	16
00537	00474	00419	00370	00328	17
00395	00346	00304	00267	00234	18
00290	00253	00220	00192	00167	19
00213	00184	00159	00138	00120	20
00157	00135	00115	00099	00085	21
00115	00098	00084	00071	00061	22
00085	00072	00061	00051	00044	23
00062	00052	00044	00037	00031	24
00046	00038	00032	00027	00022	25

8%	9%	10%	Year
0.9259	0.9174	0.9091	1
1.7833	1.7591	1.7355	2
2.5771	2.5313	2.4868	3
3.3121	3.2397	3.1699	4
3.9927	3.8896	3.7908	5
4.6229	4.4859	4.3553	6
5.2064	5.0329	4.8684	7
5.7466	5.5348	5.3349	8
6.2469	5.9852	5.7590	9
6.7101	6.4176	6.1446	10
7.1389	6.8052	6.4951	11
7.5361	7.1607	6.8137	12
7.9038	7.4869	7.1034	13
8.2442	7.7861	7.3667	14
8.5595	8.0607	7.6061	15
8.8514	8.3125	7.8237	16
9.1216	8.5436	8.0216	17
9.3719	8.7556	8.2014	18
9.6036	8.9501	8.3649	19
9.8181	9.1285	8.5136	20
10.0168	9.2922	8.6487	21
10.2007	9.4424	8.7715	22
10.3710	9.5802	8.8832	23
10.5287	9.7066	8.9847	24
10.6748	9.8226	9.0770	25

TABLE A-2

Present value of one dollar per year, n years at i%

Years	1%	2%	3%	4%	5%	6%	7%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243
4	3.9020	3.8077	3.7171	3.6299	3.5459	3.4651	3.3872
5	4.8535	4.7134	4.5797	4.4518	4.3295	4.2123	4.1002
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665
7	6.7282	6.4720	6.2302	6.0020	5.7863	5.5824	5.3893
8	7.6517	7.3254	7.0196	6.7327	6.4632	6.2098	5.9713
9	8.5661	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152
10	9.4714	8.9825	8.5302	8.1109	7.7217	7.3601	7.0236
11	10.3677	9.7868	9.2526	8.7604	8.3064	7.8868	7.4987
12	11.2552	10.5753	9.9539	9.3850	8.8632	8.3838	7.9427
13	12.1338	11.3483	10.6349	9.9856	9.3935	8.8527	8.3576
14	13.0037	12.1062	11.2960	10.5631	9.8986	9.2950	8.7454
15	13.8651	12.8492	11.9379	11.1183	10.3796	9.7122	9.1079
16	14.7180	13.5777	12.5610	11.6522	10.8377	10.1059	9.4466
17	15.5624	14.2918	13.1660	12.1656	11.2740	10.4772	9.7632
18	16.3984	14.9920	13.7534	12.6592	11.6895	10.8276	10.0591
19	17.2261	15.6784	14.3237	13.1339	12.0853	11.1581	10.3356
20	18.0457	16.3514	14.8774	13.5903	12.4622	11.4699	10.5940
21	18.8571	17.0111	15.4149	14.0291	12.8211	11.7640	10.8355
22	19.6605	17.6580	15.9368	14.4511	13.1630	12.0416	11.0612
23	20.4559	18.2921	16.4435	14.8568	13.4885	12.3033	11.2722
24	21.2435	18.9139	16.9355	15.2469	13.7986	12.5503	11.4693
25	22.0233	19.5234	17.4131	15.6220	14.0939	12.7833	11.6536

Source: Solomon, op. cit., pp. [illegible]

TABLE A 2

Present value of one dollar per year, n years at r%

Year	11%	12%	13%	14%
1	0.9009	0.8929	0.8850	0.8772
2	1.7125	1.6901	1.6681	1.6467
3	2.4437	2.4018	2.3612	2.3216
4	3.1024	3.0373	2.9745	2.9137
5	3.6959	3.6048	3.5172	3.4331
6	4.2305	4.1114	3.9976	3.8887
7	4.7122	4.5638	4.4226	4.2883
8	5.1461	4.9676	4.7988	4.6389
9	5.5370	5.3282	5.1317	4.9464
10	5.8892	5.6502	5.4262	5.2161
11	6.2065	5.9377	5.6869	5.4527
12	6.4924	6.1944	5.9176	5.6603
13	6.7499	6.4235	6.1218	5.8424
14	6.9819	6.6282	6.3025	6.0021
15	7.1909	6.8109	6.4624	6.1422
16	7.3792	6.9740	6.6039	6.2651
17	7.5488	7.1196	6.7291	6.3729
18	7.7016	7.2497	6.8399	6.4674
19	7.8393	7.3658	6.9380	6.5504
20	7.9633	7.4694	7.0248	6.6231
21	8.0751	7.5620	7.1016	6.6870
22	8.1757	7.6446	7.1695	6.7429
23	8.2664	7.7184	7.2297	6.7921
24	8.3481	7.7843	7.2829	6.8351
25	8.4217	7.8431	7.3300	6.8729

15%	16%	17%	18%	19%	20%	Year
0.8696	0.8621	0.8547	0.8475	0.8403	0.8333	1
1.6257	1.6052	1.5852	1.5656	1.5465	1.5278	2
2.2832	2.2459	2.2096	2.1743	2.1399	2.1065	3
2.8550	2.7982	2.7432	2.6901	2.6386	2.5887	4
3.3522	3.2743	3.1993	3.1272	3.0576	2.9906	5
3.7845	3.6847	3.5892	3.4976	3.4098	3.3255	6
4.1604	4.0386	3.9224	3.8115	3.7057	3.6046	7
4.4873	4.3436	4.2072	4.0776	3.9544	3.8372	8
4.7716	4.6065	4.4506	4.3030	4.1633	4.0310	9
5.0188	4.8332	4.6586	4.4941	4.3389	4.1925	10
5.2337	5.0286	4.8364	4.6560	4.4865	4.3271	11
5.4206	5.1971	4.9884	4.7932	4.6105	4.4392	12
5.5831	5.3423	5.1183	4.9095	4.7147	4.5327	13
5.7245	5.4675	5.2293	5.0081	4.8023	4.6106	14
5.8474	5.5755	5.3242	5.0916	4.8759	4.6755	15
5.9542	5.6685	5.4053	5.1624	4.9377	4.7296	16
6.0472	5.7487	5.4746	5.2223	4.9897	4.7746	17
6.1280	5.8178	5.5339	5.2732	5.0333	4.8122	18
6.1982	5.8775	5.5845	5.3162	5.0700	4.8435	19
6.2593	5.9288	5.6278	5.3527	5.1009	4.8696	20
6.3125	5.9731	5.6648	5.3837	5.1268	4.8913	21
6.3587	6.0113	5.6964	5.4099	5.1486	4.9094	22
6.3988	6.0442	5.7234	5.4321	5.1668	4.9245	23
6.4338	6.0726	5.7465	5.4509	5.1822	4.9371	24
6.4641	6.0971	5.7662	5.4669	5.1951	4.9476	25

TABLE A-2

Present value of one dollar per year, n years at r%

Year	21%	22%	23%	24%	25%	26%	27%
1	0.8264	0.8197	0.8130	0.8065	0.8000	0.7937	0.7874
2	1.5095	1.4915	1.4740	1.4568	1.4400	1.4235	1.4074
3	2.0739	2.0422	2.0114	1.9813	1.9520	1.9234	1.8956
4	2.5404	2.4936	2.4483	2.4043	2.3616	2.3202	2.2800
5	2.9260	2.8636	2.8035	2.7454	2.6893	2.6351	2.5827
6	3.2446	3.1669	3.0923	3.0205	2.9514	2.8850	2.8210
7	3.5079	3.4155	3.3270	3.2423	3.1611	3.0833	3.0087
8	3.7256	3.6193	3.5179	3.4212	3.3289	3.2407	3.1564
9	3.9054	3.7863	3.6731	3.5655	3.4631	3.3657	3.2728
10	4.0541	3.9232	3.7993	3.6819	3.5705	3.4648	3.3644
11	4.1769	4.0354	3.9018	3.7757	3.6564	3.5435	3.4365
12	4.2785	4.1274	3.9852	3.8514	3.7251	3.6060	3.4933
13	4.3624	4.2028	4.0530	3.9124	3.7801	3.6555	3.5381
14	4.4317	4.2646	4.1082	3.9616	3.8241	3.6949	3.5733
15	4.4890	4.3152	4.1530	4.0013	3.8593	3.7261	3.6010
16	4.5364	4.3567	4.1894	4.0333	3.8874	3.7509	3.6228
17	4.5755	4.3908	4.2190	4.0591	3.9099	3.7705	3.6400
18	4.6079	4.4187	4.2431	4.0799	3.9279	3.7861	3.6536
19	4.6346	4.4415	4.2627	4.0967	3.9424	3.7985	3.6642
20	4.6567	4.4603	4.2786	4.1103	3.9539	3.8083	3.6726
21	4.6750	4.4756	4.2916	4.1212	3.9631	3.8161	3.6792
22	4.6900	4.4882	4.3021	4.1300	3.9705	3.8223	3.6844
23	4.7025	4.4985	4.3106	4.1371	3.9764	3.8273	3.6885
24	4.7128	4.5070	4.3176	4.1428	3.9811	3.8312	3.6918
25	4.7213	4.5139	4.3232	4.1474	3.9849	3.8342	3.6943

28%	29%	30%	Year
0.7813	0.7752	0.7692	1
1.3916	1.3761	1.3609	2
1.8684	1.8420	1.8161	3
2.2410	2.2031	2.1662	4
2.5320	2.4830	2.4356	5
2.7594	2.7000	2.6427	6
2.9370	2.8682	2.8021	7
3.0758	2.9986	2.9247	8
3.1842	3.0997	3.0190	9
3.2689	3.1781	3.0915	10
3.3351	3.2388	3.1473	11
3.3868	3.2859	3.1903	12
3.4272	3.3224	3.2233	13
3.4587	3.3507	3.2487	14
3.4834	3.3726	3.2682	15
3.5026	3.3896	3.2832	16
3.5177	3.4028	3.2948	17
3.5294	3.4130	3.3037	18
3.5386	3.4210	3.3105	19
3.5458	3.4271	3.3158	20
3.5514	3.4319	3.3198	21
3.5558	3.4356	3.3230	22
3.5592	3.4384	3.3254	23
3.5619	3.4406	3.3272	24
3.5640	3.4423	3.3286	25

TABLE A-2

Present value of one dollar per year, n years at r%

Year		32%	33%	34%	35%	36%	37%
1	0.7634	0.7576	0.7519	0.7463	0.7407	0.7353	0.7299
2	1.3461	1.3315	1.3172	1.3032	1.2894	1.2760	1.2627
3	1.7909	1.7663	1.7423	1.7188	1.6959	1.6735	1.6516
4	2.1305	2.0957	2.0618	2.0290	1.9969	1.9658	1.9355
5	2.3897	2.3452	2.3021	2.2604	2.2200	2.1807	2.1427
6	2.5875	2.5342	2.4828	2.4331	2.3852	2.3388	2.2939
7	2.7386	2.6775	2.6187	2.5620	2.5075	2.4550	2.4043
8	2.8539	2.7860	2.7208	2.6582	2.5982	2.5404	2.4849
9	2.9419	2.8681	2.7976	2.7300	2.6653	2.6033	2.5437
10	3.0091	2.9304	2.8553	2.7836	2.7150	2.6495	2.5867
11	3.0604	2.9776	2.8987	2.8236	2.7519	2.6834	2.6180
12	3.0995	3.0133	2.9314	2.8534	2.7792	2.7084	2.6409
13	3.1294	3.0404	2.9559	2.8757	2.7994	2.7268	2.6576
14	3.1522	3.0609	2.9744	2.8923	2.8144	2.7403	2.6698
15	3.1696	3.0764	2.9883	2.9047	2.8255	2.7502	2.6787
16	3.1829	3.0882	2.9987	2.9140	2.8337	2.7575	2.6852
17	3.1931	3.0971	3.0065	2.9209	2.8398	2.7629	2.6899
18	3.2008	3.1039	3.0124	2.9260	2.8443	2.7668	2.6934
19	3.2067	3.1090	3.0169	2.9299	2.8476	2.7697	2.6959
20	3.2112	3.1129	3.0202	2.9327	2.8501	2.7718	2.6977
21	3.2147	3.1158	3.0227	2.9349	2.8519	2.7734	2.6991
22	3.2173	3.1180	3.0246	2.9365	2.8533	2.7746	2.7000
23	3.2193	3.1197	3.0260	2.9377	2.8543	2.7754	2.7008
24	3.2209	3.1210	3.0271	2.9386	2.8550	2.7760	2.7013
25	3.2220	3.1220	3.0279	2.9392	2.8556	2.7765	2.7017

38%	39%	40%	Year
0.7246	0.7194	0.7143	1
1.2497	1.2370	1.2245	2
1.6302	1.6093	1.5889	3
1.9060	1.8772	1.8492	4
2.1058	2.0699	2.0352	5
2.2506	2.2086	2.1680	6
2.3555	2.3083	2.2628	7
2.4315	2.3801	2.3306	8
2.4866	2.4317	2.3790	9
2.5265	2.4689	2.4136	10
2.5555	2.4956	2.4383	11
2.5764	2.5148	2.4559	12
2.5916	2.5286	2.4685	13
2.6026	2.5386	2.4775	14
2.6106	2.5457	2.4839	15
2.6164	2.5509	2.4885	16
2.6206	2.5546	2.4918	17
2.6236	2.5573	2.4941	18
2.6258	2.5592	2.4958	19
2.6274	2.5606	2.4970	20
2.6285	2.5616	2.4979	21
2.6294	2.5623	2.4985	22
2.6300	2.5628	2.4989	23
2.6304	2.5632	2.4992	24
2.6307	2.5634	2.4994	25

ANNEX IV

H A N D O U T S

presented by Mr.T. Orfaly

UNIDO TRAINING WORKSHOP SEMINAR

IN INDUSTRIAL PROJECT

PREPARATION, EVALUATION AND FINANCING

Prepared by

T. ORFALY

PROJECT OUTLINE: THE PROJECT CYCLE

(APRIL 16 – MAY 4, 1984)

IN

HAVANA – CUBA

COURSE OUTLINE

I. Objectives:

- What is a feasibility study?
- Feasible under what terms and conditions. Project might be feasible but at a very high cost and risk.
- What are we attempting to measure: commercial profitability, return versus risk National economic benefit, definition of each of the above.
- Why feasibility studies are undertaken: knowledge of terms, conditions and risks - to be assured of a certain degree of success if implemented.
- Developing countries aim at increasing industrial output. Thus studies should keep pace to properly allocate scarce resources. Hence, pre-investment studies are a prerequisite for investment decisions.
- Pre-investment studies assists in identification and selection of projects.

II. Stages of project preparation:

- How many phases are there before a project be operational? and what kind of studies do we undertake at each phase?
- Pre-investment phase - investment phase - operational phase.

III Project identification:

1. Preinvestment phase:

A - Identification of investment opportunities (Project idea) Sketchy in nature (aggregate estimates)

Investment opportunities could be identified by analysis:

- Availability of Natural resources - electricity, oil, wood based industries.
- Existing agricultural products that could serve as basis of agro-industry.
- Import to identify import-substitution products.
- Manufacturing sectors successful in other countries at same level of development.
- Possible interlinkage with other industries.
- Possible integeration of existing line of manufacturing such as petrochemical industry for a refinery.
- Possible diversification (pharmeceutical), horizontal expension
- Expansion or modernization of existing facility to cover market.

- Government industrial policies.

- Export possibilities.

a) General opportunity studies are 4 types:

i) Area studies: region or area

ii) Subsectorial studies: Building materials, food processing

iii) Resource-based: Aluminium, petrochemical

iv) Need-based: Interlinked with other project.

b) Specific project opportunity studies, transformation of a project ideas into investment proposition to interest investor (project profiles). (Cost limited .2% to 1% of total project cost, precision ± 40%).

The larger the required investment cost and the complexity of the project, the greater the need to deepen the study to feasibility one.

B. Pre-feasibility studies.

Intermediate stage between opportunity and feasibility study.

Same structure than feasibility with less details. It can also be by-passed. If doubtful project pre-feasibility necessary. (Cost .25% to 1.5% of total project cost (Precision ± 20%).

C. Support sutdies:

They cover one or more aspects but not all aspects of investment opportunities.

1. Market studies

2. Raw material and inputs studies (price, Trend, substitutes)

3. Location studies (transport cost)

4. Laboratory studies (suitability studies of raw materials).

5. Economics of scale studies (Technology, size). Structure of operating costs.

6. Equipment selection studies (equipment identification - bid preparation, mecanized, semi-mecanized, manual versus maintenance).

- Their content varies and they become part of future studies.

- They are undertaken before a feasibility or prefeasibility.

- They are also undertaken after the feasibility due to change.

- Small in size in relation to feasibility.

D. Feasibility studies:

Must provide technical, economic and commercial information with possible alternatives, drawings, tables, sketches by a team of experts.

Should provide a project of a defined production capacity at a selected location, using particular technology in relation to defined materials and inputs at identified investment and production cost, and sales revenues yielding a defined return.

- A large puzzle where each piece must fit its place and the whole unit provide a good picture.

- Scope should be defined.

- Full coverage with emphasis on different aspects depending on project.

- Feedback interlinkage describing the optimization process.

- Derived from demand or available input(Market or resources base

- Not an end in itself but to arrive at an investment decision, which decision may differ from study.
(Cost 1% to 3% small project, .2% to 1% large industry
(Precision ± 10%).

E. Evaluation and decision stage (Evaluation report).

2. Investment phase:

A Negotiation (joint venture, legal status of establishment)and financing line-up.

B Project design and contracting stage.

C Construction stage and manpower training.

D Commissioning stage.

3. Operational phase:

The pre-investment phase determines the ultimated success or failure of an industrial activity. The pre-investment studies are the sub-structure if solid then upper structure will hold.

Feasibility Study Scope:

Scope of study coverage must be clearly defined. Should include production cost related to supply inputs, delivery of outputs.

Includes all activities necessary to the survival of project e.g. extraction and off-site transport, storage, delivery, housing, recreational (agro industry and marble case).

- Should cover preceding and succeeding stage of the project production process.

- Divide the project into corponent (production, transport, assembly, painting, finishing etc.) cost centers.

Limitations:

All data are not always available hence assumptions have to be made.

Available data from:

1. call for tenders
2. similar project
3. unit cost parameters from corparable operating project
4. Lump-sum cost for group of equipment based on corparable project.

(3 and 4) should be

- adjustment for inflation
- exchange rate changes
- difference in local condition
- difference in law and regulation

Other source reference:- Industrial association, equipment manufacture (case cement project), development banks, International Organization Care in their application due to their date of collection, plant size, country of origin.

Definition:

Capacity is defined as a measure of output in an agreed period of time. Measuring the output could be unit/hour or unit/month or unit/year. Monthly and yearly are not the result of simple multification of the hour output. Thus the following definition:

- Installed capacity = nominal output of units per hour
- Nominal maximum capacity = unit/hour output x time.

- Feasible normal capacity = unit/hour output x feasible time (which is time minus maintenance, repair, breaks, holidays, shifts, tool changes etc.)

- Statistical capacity = empirically proven.

- Local and Foreign exchange:

  Most project require local and foreign exchange. Thus it is necessary that all the project cost be converted into an agreed governing currency.

- Contingency: Two Types: 1. physical, 2. Financial (escalation cost).

  1. Physical = for raw material, utility, manpower, sales etc.

  2. Financial = For investment cost, production cost and sales.

  - Different contingency rates for different items (imported local).

  - Accuracy of investment and production cost estimates increase as from one stage to the next.

Project team: To cover major substantive fields of project: For a large project would require for example the following multidiciplinary Team:

- One industrial economist
- One market analyst
- One or more Technologist/engineer specialized in the project
- One mechanical engineer
- One civil engineer
- One financial analyst

- Plus land surveyor, soil expert, laboratory expert.

Characteristics of an Acceptable Feasibility Study:

1. Measurability of results
2. Clarity of concepts and criteria
3. Comprehensive in composition

4. Integrated in structure

5. Dependability of information inputs

6. Consistency of corpositions and conclusions

7. Updated data base

8. Selectivity in considering alternatives.

What is a Project:

It could be: New project, expansion, diversification, change in technology, change in material, change in location, modernisation, new shift work.

Studies apply not only to new project but also to the above.
For expansion project:

Compare the projected financial results of the expansion to the existing facility projected results to find out the viability of the new proposed expansion vis-a-vis the existing one.

What is project planning?

Planning investment decisions on:

1. What to produce

2. How much to produce

3. Where to produce

4. How to produce

5. How to distribute

6. How to finance

7. How to manage.

Decisions on alternatives of Product and product mix could cover:

Size

Location

Technology

Method of financing

Market segment

Organizational structure

Implementation programme.

****

Introduction to Industrial Project Preparation and Evaluation

What does a feasibility study comprise

I. Project Background and History.

A - Project background

B - Sponsor/promoter

C - Project history

D - Executive management list

E - Agreement and License.

II. Demand and Market Analysis

A - Manufacturers' criteria for a New Product

B - Market assessment

1. Product characteristics
2. Product classification
3. Price level and trends
4. Government policies
5. Channels and distribution
6. Market supply
7. Market demand
8. Content of demand analysis.

C - Sales forecasting methods

1. Trend extrapolation
2. Consumption level method (income and price elasticity of demand)
3. End-use (consumption coefficient)
4. Regression models

D - Market Surveys

E - Estimates Sales Revenues.

III. Production Programme

Place of the production programme in the over-all industrial development programme

Data required to set up production programme

Constraints and options

- sales
- storage requirements
- operational

Selection of the production programme

Time schedule of production

- initial
- operational

Wastes and effluents as limits of production programme

- quantities
- quality
- treatment

Which way the economical feasibility is affected by the production programme

IV. Plant Capacity

Definitions

Factors differentiating maximum and feasible capacity

Time dependence of the plant capacity

Constraints and options of the plant capacity

- market build-up
- raw materials availability
- supply schedule of raw materials
- step-wise development of the plant capacity

Influence of the technology and equipment on plant capacity

Size-cost relation of the equipment and installations

Procedures of size-cost estimate

Adjustment of the plant capacity to the production outputs

V. Materials and Inputs

A - Characteristics of materials and inputs

1 - Classification

2 - Data and alternative

3 - Selection and description of materials and inputs

B - Supply programme

1 - Fundamental data and alternatives

2 - Considerations when setting supply programme

C - Selection of supply programme

D - Cost estimates

VI. Project Layout - Technology and Engineering

Project layout-preliminary project

Types of project layouts and their functions

General functional layout

- site arrangement
- equipment arrangement

Material flow diagram

Material balance

Production process diagram

Utility consumption diagram

Telecommunication and electricity diagrams

Organisation charts

Technology

Definitions

Resources of technology

- research
- aquisition

Comparative study on technology

Selection of the technology

- parameters of technology
- means of aquisition and contract structure
- cost-preliminary estimate

Engineering and equipment purchasing

- engineering drawings and specifications
- selection of the equipment
- cost estimate of equipment

Civil engineering

Classification of the civil engineering

- site preparation
- outdoor installations engineering
- buildings and constructions
- special civil works

- Cost estimate

VII. Plant Organization and Overhead Costs

A - Cost centers

B - Overhead costs

VIII. Manpower

Purposes of manpower planning

Classification of production Labor

Labor estimates

- sources of information
- engineering methods of labor demand estimate

Training

Local and foreign personnel - selection of personnel

Training and productivity standards

Scheduling of the manpower

Estimates of labor cost

Surcharges on salaries and wages

Administrative and management cost

IX. Location and Site

A - Location

1 - Data and alternatives

2 - Choice of location

B - Sites

1 - Data and alternatives

2 - Site selection

3 - Cost estimate

C - Local conditions

D - Environmental impacts

X. Implementation Schedule

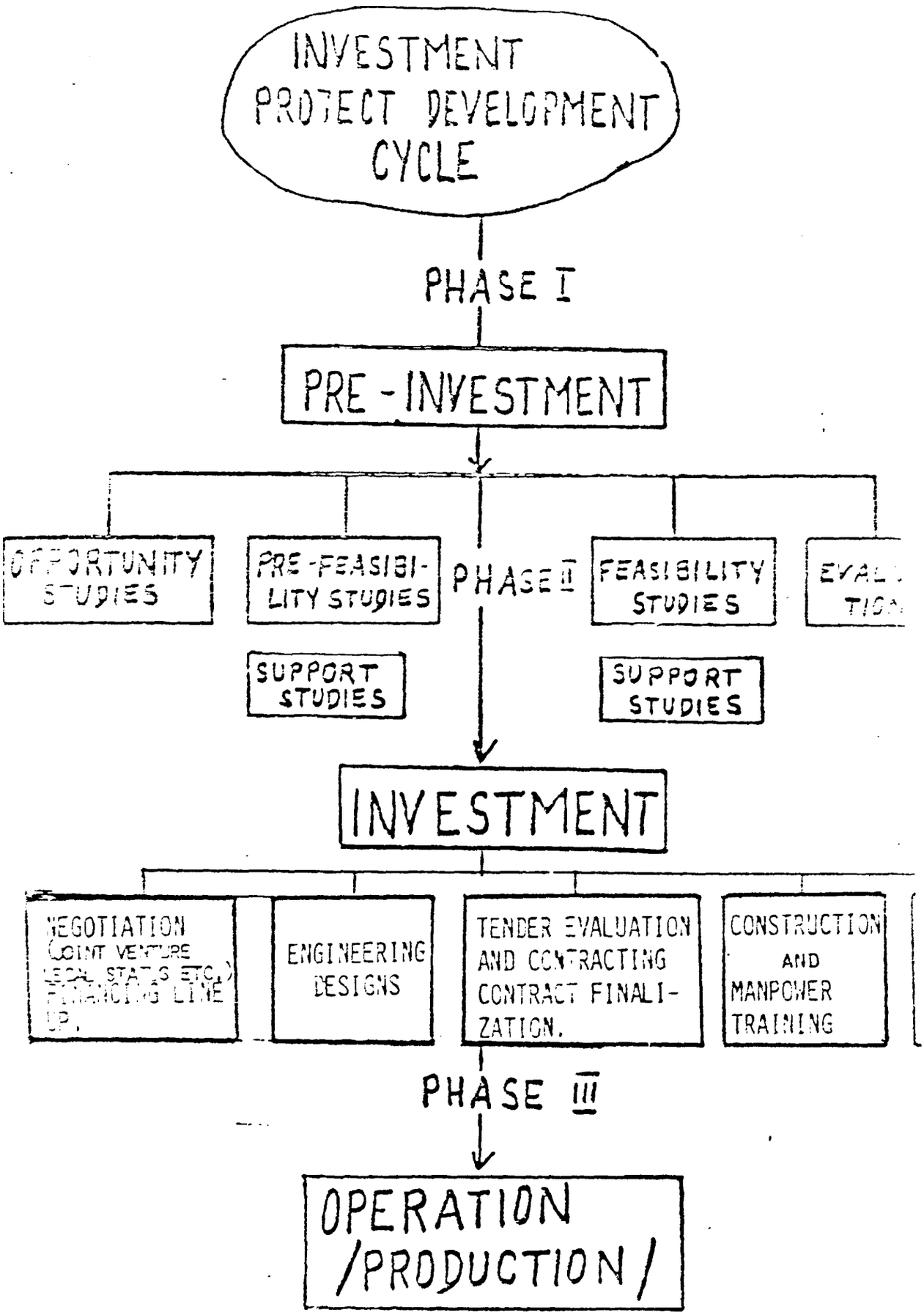
Stages of the implementation of the project

- preconstruction
- construction
- plant commissioning

Purchase of the equipment
Detailed engineering
Contracting civil works
Arrangements for financing
Construction programme
Scheduling methodology
Control methods of schedule implementation

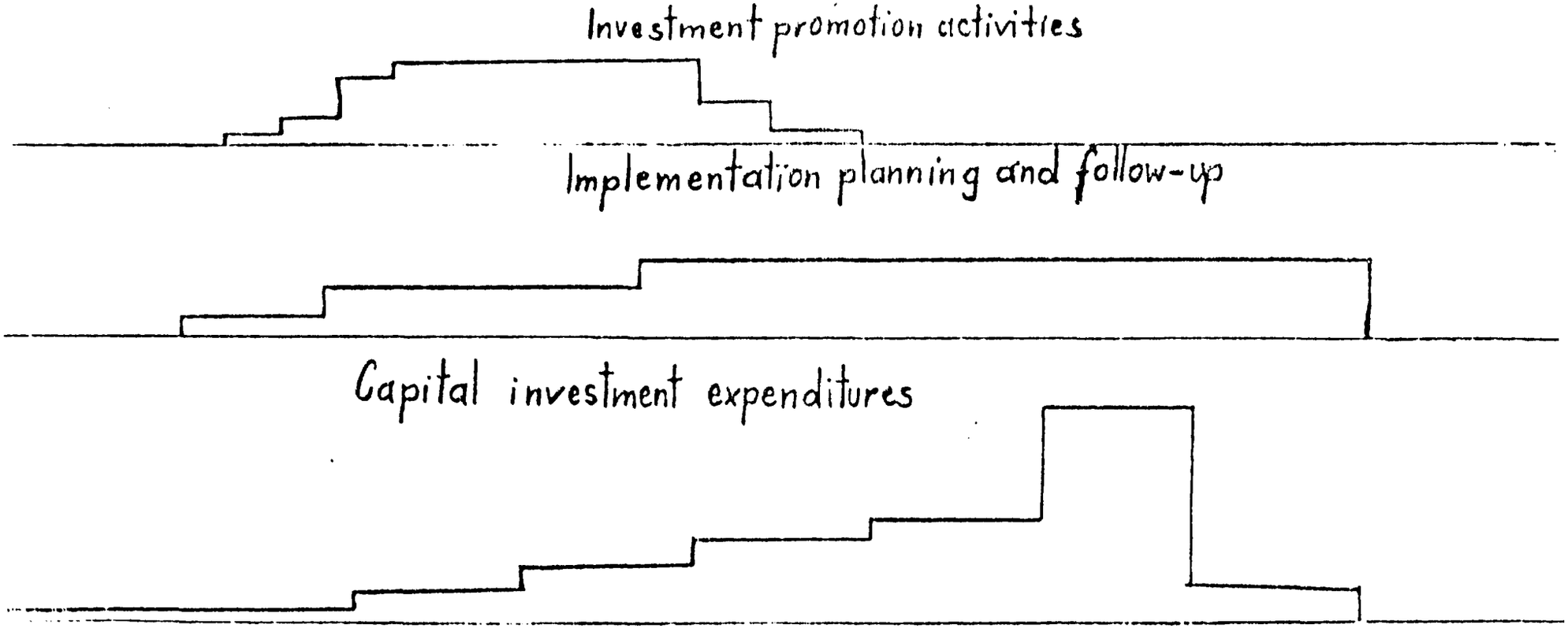
XI. Financial and Economic Evaluation

A - Estimated fixed investment cost and pre-operation cost
B - Estimated initial working capital requirements
C - Sources of financing
D - Capital structure
E - Annual production cost
F - Net income statement
G - Sources and uses of funds for financial planning
H - Proforma balance sheet for financial planning.
I - Significance and structure of evaluation
J - Financial evaluation: Ratios (debt/equity, profitability, debt-service coverage)
K - Financial evaluation cash flow N.P.V., I.R.R., Payback period
L - Financial evaluation under uncertainty
M - Sensitivity analysis
N - Principiles of social benefit cost analysis
O - Economic evaluation: Value added
P - Economic evaluation: Pricing rules
Q - Economic evaluation: Employment generation
R - Economic evaluation: Foreign exchange savings
S - Economic evaluation: Income distribution
T - Economic evaluation: Additional criteria
U - Economic evaluation: Supplementary considerations.


INVESTMENT PROJECT DEVELOPMENT CYCLE
PHASE I
PRE-INVESTMENT
OPPORTUNITY STUDIES
PRE-FEASIBILITY STUDIES
PHASE II
FEASIBILITY STUDIES
SUPPORT STUDIES
SUPPORT STUDIES
INVESTMENT
NEGOTIATION (JOINT VENTURE LEGAL STATUS ETC.) FINANCING LINE UP.
ENGINEERING DESIGNS
TENDER EVALUATION AND CONTRACTING CONTRACT FINALIZATION.
CONSTRUCTION AND MANPOWER TRAINING
PHASE III
OPERATION /PRODUCTION/

PROJECT DEVELOPMENT CYCLE

PRE-INVESTMENT PHASE				INVESTMENT PHASE				OPERATION PHASE
Identification of investment opportunities (Project ideas)	Preliminary selection stage (Pre-feasibility study)	Project formulation stage (Techno-economic feasibility study)	Evaluation and decision stage (Evaluation report)	Negotiation (Joint venture legal formation of establish etc.) financing line up.	Project design and contracting stage.	Construction stage	Start-up stage	



TYPES OF DECISIONS TO BE TAKEN DURING DIFFERENT PRE-INVESTMENT STAGES

DECISION	ANALYSIS TOOL STUDY	DECISION GOAL
Identification	General or project opportunity studies	Identify opportunity Determine critical area for support stud Determine area for pr feasibility or feasibi ty studies
Preliminary analysis	Support studies	Determine which of possible choices is more viable Identify the choice of project criteria
	Pre-feasibility studies	Determine provisiona viability of the proj Appraise if the feasibi study should be launc
Final analysis	Support studies	Investigate in detail ted criteria requiring depth-study
	Feasibility study	Make the final choices project characteristic Determine the feasibilit the project and selecte criteria
Project evaluation	Evaluation study	Make final investmen decision

MAIN HEADINGS OF THE CONTENT OF A FEASIBILITY STUDY

1. EXECUTIVE SUMMARY
2. PROJECT BACKGROUND AND HISTORY
3. MARKET AND PLANT CAPACITY
   - DEMAND AND MARKET STUDY
   - SALES AND MARKETING
   - PROJECTION PROGRAMME
   - PLANT CAPACITY
4. MATERIAL INPUTS
   - MATERIALS AND INPUTS
   - SUPPLY PROGRAMME
5. LOCATION AND SITE
   - LOCATION
   - PLANT SITE AND LOCAL CONDITIONS
   - ENVIRONMENTAL IMPACT
6. PROJECT ENGINEERING
   - LAYOUT AND PHYSICAL COVERAGE OF PROJECT
   - TECHNOLOGY AND EQUIPMENT
   - CIVIL ENGINEERING
7. PLANT ORGANIZATION AND OVERHEAD COSTS
   - PLANT ORGANIZATION
   - OVERHEAD COSTS
8. MANPOWER
   - LABOUR
   - STAFF
9. PROJECT IMPLEMENTATION
10. FINANCIAL AND ECONOMIC EVALUATION
    - TOTAL INVESTMENT OUTLAY
    - PROJECT FINANCING
    - PRODUCTION COST
    - COMMERCIAL PROFITABILITY
    - SOCIO-ECONOMIC EVALUATION

Project Background and History.

A. Project Background

1. New Project, expansion, modernization, etc.

2. Product and Product mix description

3. Plant capacity, the programme to attain it and location

4. Market or raw material orientation

5. Number working days, shifts and implementation schedule

6. Product quality, economic shelflife, technical particularities, special requirement for storage, transportation, usage

7. Product uses and applications

8. Project objective, what it will achieve (self sufficiency, job creation, advance technology). Economic, Industrial, financial and other policies supporting the project.

B. Sponsor/Proponent

1. Sponsor/Proponent current activity (products being manufactured quality, quantity) his financial means and role in the project.

C. Project History

1. History development of project (year of establishment, legal form, ownership structure) and its development.

2. Studies performed (title, author, date ordering party.

3. Decision taken from these studies.

D. The management organization and list of executive management with brief C.V. and organization chart.

E. Agreement and License

1. Technical know how, management agreement, licensing, patent .

2. Contract with engineers, architects, quantity surveyors, consultants, contractors, project technical partners or managers, sales take-out.

3. Government and/or business license requirement.

UNIDO TRAINING WORKSHOP SEMINAR

IN INDUSTRIAL PROJECT

PREPARATION, EVALUATION AND FINANCING

Prepared by

T. ORFALY

MATERIALS AND INPUTS

(April 16 - May 4, 1984)

IN

HAVANA - CUBA

Jocaphas H.

MATERIALS & INPUTS

- close relation between input requirement and production programme, location and technology and equipment.

Material and inputs classified into

1) Raw Material (unprocessed or processed) - Quality assessed mainly for agricultural production

   - for project based on future agricultural production call for actual cultivation test

- Mineral should be based on proven reserves and lab analysis

Quality of material (case of high content of sulfate and chloride in aggregate) [illegible] danger to prestress concrete.

2. [illegible] industrial materials and components.

   - [illegible] metals, semi-processed and manufactured parts: define requirements, availability and costs,

   - potential sources, alternative sources, and prices,

3. Auxiliary materials and factory supplies:

   - chemicals, additives, packaging materials paints, factory supplies, as maintenance material.

4. Accessories: electricity, water, steam, compressed air, fuel, effluent disposal made after selection of technology plant capacity and location & Bottle-necks (electricity, water...)

   - electricity = maximum power demand, the connected load, standby

   - water = general estimate for production, auxiliary and general and quality of water Brakish (recycling)

   - fuel = for cars, for diesel engine etc.

Input alternatives = different raw material that can be used should be studied

Qualitative properties of Material and inputs

Physical properties : size, dimension, form, density, porosity gaseous, liquid, solid, melting and boiling point.

Mechanical properties: formability, elasticity, hardness, fatigue resistance

Chemical properties: Form, composition, purity, flammability

Electrical and magnetic: magnetization, conductivity to elect.

Sources and quantities available

Viability of project are based on constant availability of M.I.

The location of M.I. where it is available is important as its transportation cost and Time and the available mean of transport (case of cement)

When M.I. are to be important the source of import identified and alternative sources lined up

Uncertainity of constant supply should be mentioned.

Unit costs

- Past trend and future projection, elasticity.
- The import CIF + land transport + Taxes should be used.

Supply Programme

Production programme serve as a basis to calculate inputs additional storage cost should be added

UNIDO TRAINING WORKSHOP ON LINEAR
IN INDUSTRIAL PROJECT
PREPARATION, EVALUATION AND FINANCING

Prepared by
T. OREALY

LOCATION AND SITE
(April 16 - May 4, 1984)

IN

HAVANA * CUBA

LOCATION AND SITE

Public Policies

- subsidies to locate in underdeveloped area
- decentrelization
- pollution

Material/Market orientation

- Proximity to raw material and input availability
- Proximity of consumption centre
- Infrastructure facility availability
- based on above calculate transport, production and distribution cost at alternative location
- imported material project located close to port or terminals.
- agro-industry close to market or perishbles
- petrochemical not affected be it near resource or consumption on intermediation point (singapore).

Location conditions:

Infrastructure: infrastructure availability vital to the operation

- if electricity not available and location cannot be changed special power station to be accounted for
- Rail, road, water, sea, air transport availability to be studied as per distance, congestón, fees, storage facilities, cranes, road width, bridges, section of road to be constructed to the factory rolling stock of rail (cement case)
- water transport, barges, other vessel (case of pre-fab. & pre cast on barges, container so - so, lash system

- water availability and quality (recycling it or not and cost of the production, utility and human consumption (water well and purification and system cost),

- Telex, Telephone, Banking, Post Office, Schools etc.

Socio-economic environments:

- waste disposal (emission, noice, liquid, solid) To solve these problem

- labour availability: skilled, semi-skilled, cost, housing and Training.

- cost of construction might be a determinent

- fiscal and legal : income tax (T.F.Z.), excise duties, sales tax (Quebec, Alburta) incentive concessions, industrial park.

- climatic = climate temperature, humidity (textile), air condition, rainfall, flooding, dust fumes, earthquake.

Final choice of location

Starting point should be the raw material source and consumption centre followed by the analysis of all the above described element.

The best location where production cost lowest. For other projects where it does not make any difference to locate where social welfare availability would be the determinent.

Site Selection

Two or 3 different sites should be considered

evaluation of the characteristics of each:

- cost of land (or rent) industrial park
- local condition: infrastructure and socio economic environment

  /availability and cost of electricity (extention line and power substation)

  /transport availability clos to rails, road etc.

  /water availability from pipe, river, well (Pulp and Paper industry)

  /disposal of effluent (cement and wind direction to urban area carefully studied)

  /labour availability (housing availability)

  /soil condition, ground water level

Final Site Selection

Based on above however sometime according to project sponsors desire.

[illegible]

Prepared by

T. [illegible]FALY

MAN POWER

(April 16 - May 4, 1984)

IN

HAVANA - CUBA

MAN POWER

- After determining plant production programme and establish technological process.

  - Prepare organizational layout
  - Skill requirement in each position
  - Availability of labour, local/foreign
  - Selection of labour
  - Prepare detailed structure (organizational chart)
  - Estimate annual labour cost at nominal feasible capacity devided into

    /cost of production labour (variable)

    /Cost of non-production labour (fixed)

Staff

  - Prepare organizational layout for staff
  - Skills requirement and level of training
  - Availability of staff local/foreign
  - Estimate annual staff cost of local and foreign staff

Manpower Requirement

- Manpower planning start at departmental level (workers: supervisor, skilled, semi-skilled, unskilled; staff: managerial, administrative, sales).
- Consideration given to

  /supply and demand of manpower

  /skills availability at national and regional level

  /knowledge of labour legislation, recruitment procedures and discharge, wage level, fringe benefits and growth rate, number of shifts.

  /number of annual working days (200 - 250 yearly).

Preproduction period

Distinction between preproduction and operation

- Preproduction: To attend to the construction and installation of equipment (maintenance workers). Establishing required man/month. To be capitalized Foreign expert requirement should be mentioned on the basis of man/month or lump sum, this should be tied to local manpower training if possible.

Operational bases

- Functions and skill level determined for total project
- Distinction between variable and fixed wage should be made and local and foreign manpower
- Number of shift identified
- Wages and salary + sick and training, leave + social security + fringe benefits, medical insurance and installation grants = total wage cost.

Labour Norms

Productivity from country to country differs for inadequate skills and experience. Thus Training is required more under these conditions. It is essential that the locally expected productivity be used not the ones of other developed countries.

Managerial staff

Managerial staff requirement in the feasibility study so that they be recruited well in time.

Success of the project mainly depend on the competance of the Team Managerial staff.

Foreign Experts

Lack of technical and managerial skill to be complemented by extensive Training in foreign countries or locally as part of Technology supply.

Employment of foreign expert to be minimized as it does not develop local skills and the period should be defined and limited and should be to training local counterpart.

Training

Training should be programmed before start up of operation as

in house training or,
at outside institute or,
at another country factory or supplier.

- Defined the training requirement for each category, location and arrangement.
- Training should be part of Technical assistance, agreement on Technology, licensing or joint venture.
- Training is not only required during the preproduction period but also during operational stage every number of month or years.

Example of Calculation of surcharge on wages and salaries

-	Official holidays	11 days
-	Leave (according to labour law)	20
-	Sickness (" to statistics)	11
-	Training and others	8
		50 days/210 working days and excluding Thursday & Friday = 24%
+	Social security (employer part)	= 10%
+	" " on unproductive working days.	= 2.4%
		36.4%

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T. ORPALY

PLANT ORGANIZATION AND OVERHEAD COSTS

April 16- May 4, 1984

IN

HAVANA - CUBA

PLANT ORGANIZATION AND OVERHEAD COSTS

- Plant divided into component (production, service and administrative cost center) is necessary.

Plant Organization

Overhead cost should be properly appropriated to operation of the factory or the administration or the sales and distribution. examples

- Production cost center: where all productive of operation are undertaken (Marble case). Marble Block extraction, Transport, cutting, recutting, polishing, packing and crating.

- Service cost center:
  - Social services e.g. housing, health service, transport
  - production workshops
  - off-site transport not related to production
  - raw material and spares purchase
  - storage services (spares, crates, suppliers)
  - repair and maintenance
  - electricity (power station)
  - steam
  - water supply
  - laboratories

- Administration and finance cost center:
  - planning, budgeting, costing, statistics, personnel, training, accounting and finance.

Overhead Cost

Factory overhead: related to the fabrication process.

- wages and salaries (not directly involved in production

- auxiliary material
- office supplies
- utilities
- repair and maintenance

To be transferred to the annual production cost schedule as part of the factory cost

Administrative overhead: when amount are important otherwise to be included under factory overhead.

- wage and salaries
- office supplies
- utilities
- communication
- rents
- insurance
- taxes

To be transferred to annual administration cost schedule as part of the factory cost.

Depreciation: is dealt with separately and is presented in the annual production cost to obtain the total production cost.

THE CONCEPT OF TIME VALUE OF MONEY

TIME VALUE OF MONEY = TIME PREFERENCE IN CASH FLOW

= THE COST OPPORTUNITY

= THE COST OF MONEY

= THE RENT OF MONEY

ABBREVIATION AND TERMINOLOGY

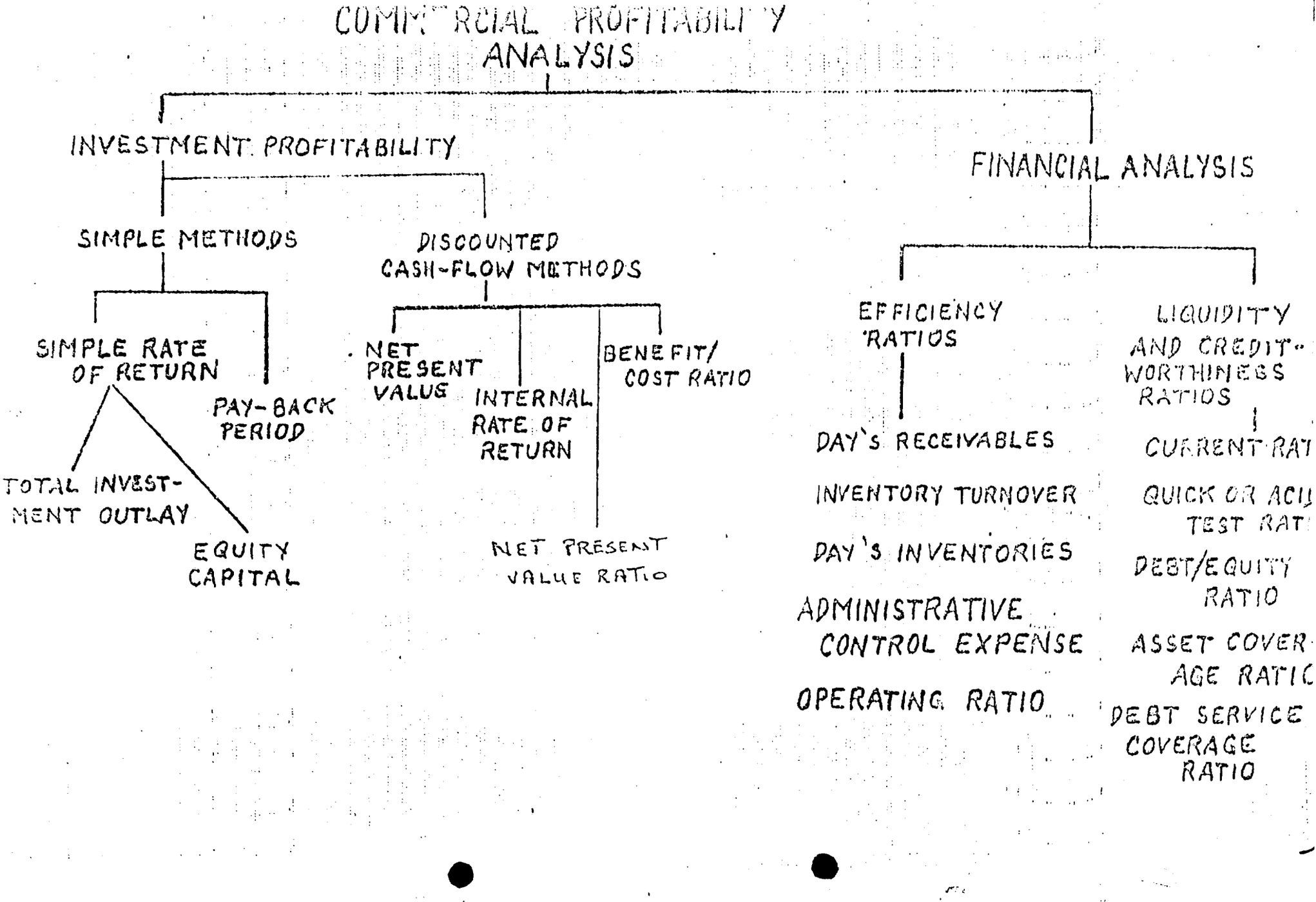
C.F.	=	Cash Flow	التدفقات النقدية
D.C.F.	=	Discounted Cash Flow	التدفقات النقدية المخصومة
P.V.	=	Present Value	القيمة الحالية
N.P.V.	=	Net Present Value	القيمة الحالية الصافية
N.P.V.R.	=	Net Present Value Ratio	القيمة الحالية الصافية [illegible]
I.R.R.	=	Internal Rate of Return	[illegible]
P.D. Ratio	=	Present Cost Ratio	

DEFINITION

DEPRECIATION/AMORTIZATION: — **الاستهلاك**

is [illegible] a NON-CASH production cost element(s). — تكلفة انتاج غير [illegible]

COMMERCIAL PROFITABILITY ANALYSIS



I. INVESTMENT PROFITABILITY

A. DISCOUNTING METHODS

1. NET PRESENT VALUE (N.P.V.)

The net present value (N.P.V.) of a project is defined as the value obtained by discounting, separately for each year, the difference of all cash outflows and inflows occurring throughout the life of a project at a fixed, pre-determined interest rate called discounting rate to the time when decision is taken to implement the project at year 0.

The discount rate or cut-off-rate, should be equal either to the actual rate of interest on long-term loan or to the interest rate paid by the borrower. This discount rate should reflect the opportunity cost of capital or the possible return on the same amount of capital invested elsewhere. The discount rate should be the minimum rate of return below which an investor considers that it does not pay for him to invest.

The N.P.V. obtained for the years of the life of the project are added to yield a total amount and could be defined as follows:

$$N.P.V. = NCF_1 + (NCF_2 + a_2) + (NCF_3 + a_3) + \ldots + (NCF_n + a_n)$$

where NCF_i is the net cash flow of a project in year 1,2,3,....n and where a_i is the discount factor in year 1,2,3,.....n

If the N.P.V. is positive, the profitability of the investment is above the cut-off discount rate and the project is acceptable. If the N.P.V. is zero the project probably should not be undertaken. If the N.P.V. is negative, the profitability is below the cut-off rate and the project should not be undertaken.

The shortcomings of the N.P.V. are the difficulty in selecting the appropriate, or accurate discount rate (cost of capital) and that N.P.V. does not show a profitability rate. In addition, it does not account for the size of the invested capital.

2. Net present value ratio (N.P.V.P)

In case of more than one opportunity project, it is advisable to

Know how much investment will be required to generate these positive NPV. The ratio of the NPV and the present value of the invested capital (PVI) required is called the net present value ratio (NPVR) and yields a discounted rate of return which is used to compare alternative projects. The formula is

$$NPVR = \frac{NPV}{PVI}$$

NPVR = Net Present Value Ratio

NPV = Net Present Value

PVI = Present Value of the Invested Capital

This method accounts for the size of the invested capital.

When only one project is being considered a positive choice should be [illegible] if the NPVR is greater than or equal to zero. When comparing [illegible] should be taken to use the [illegible] rate for all [illegible] for the difference in the discounted period it should [illegible] as a risk factor (the [illegible] should be applied) [illegible] performance of money.

[illegible]

The internal rate of return (I.R.R.) is that rate of discount which will cause the present value of all cash inflows to equal the present [illegible] cash outflows or, viewed in another way, it is the rate of [illegible] which will cause the net present value of the project to be [illegible]. It is expressed as:

$$\sum_{t=0}^{n} \left(\frac{Ft}{(1+r)^t}\right) = 0$$

where Ft = Net cash flow in period t

r = Internal rate of return

[illegible] the I.R.R. be greater than the cost of capital or the opportunity cost, the project should be accepted and if I.R.R. is lower than the cost of capital the project is to be rejected.

How to calculate the IRR.

a) Linear interpolation formula.

1. Prepare a cash-flow table.
2. Use first estimate of IRR and calculate NPV.
3. If NPV is positive, apply higher value of IRR and calculate new NPV.
4. If NPV is negative, apply lower value of IRR and calculate new NPV.
5. Repeat procedure, until NPV changes sign.
6. Apply formula

$$IRR = r_1 \frac{PV\,(r_2 - r_1)}{NV + PV}$$

where PV is the NPV (positive) at the low discount rate of r_2, and NV is the NPV (negative) at the high discount rate r_2.

The shortcoming of I.R.R. is the assumption that funds returned early in the life of a project can be reinvested at whatever I.R.R. happens to be. At high I.R.R., this assumption is obviously not valid. Furthermore, the I.R.R. method may provide multiple solutions.

4 Benefit/Cost Ratio (B/C ratio)

The benefit/cost ratio of discounted cash-flow is the index obtained by forming a ratio of the present values of cash inflows to the present values of cash outflows.

$$B/C = \frac{\sum_{i=0}^{n} CI_i \cdot a_i}{\sum_{i=0}^{n} CO_i \cdot a_i}$$

where CI is the discounted cash inflow and
CO is the discounted cash outflow.

It is to be noted that other alternative formulation exists.

NUMERICAL EXAMPLE FOR NPV

YEAR i	REVENUES	EXPENDITURES
0	-	2 000
1	-	8 000
2	5 000	4 000
3	10 000	6 000
4	10 000	6 000
5	10 000	6 000
6	10 000	6 000
NPV	-	-

CALCULATION

NCF_i	a_i at $r = 10\%$	PRESENT VALUE
- 2000	1.000	- 2000
- 8000	0.909	- 7272
1000	0.826	826
4000	0.751	3004
4000	0.683	2732
4000	0.621	2484
4000	0.564	2256
—	—	2030

B) SIMPLE METHODS (NOT DISCOUNTED)

1. PROFITABILITY RATIOS

1 MARGINS

1.1 Gross Profit Margin: is defined as:

$$\frac{\text{Sales less Cost of goods sold (factory cost)}}{\text{sales}}$$

1.2 GROSS PROFIT/SALES: is defined as Taxable profit/sales and is to measure the profitability of the project before taxes.

1.3 NET/PROFIT/SALES: is to measure the profit margin of the project after taxes

1.4 RATE OF RETURN: (should be higher than interest rate in capital market)

1.4.1 Net Profit/Paid up Capital: is to measure the profitabilities of the project vis a vis its equity capital

$$R_p = \frac{NP}{C} \times 100$$

R_p = rate of return on paid up capital
NP = Net Profit
C = Paid up Capital

1.4.2 Net Profit/Shareholders Equity or Net Worth: is to measure the profitability of the project vis a vis the total shareholders equity.

$$R_n = \frac{P}{Q} \times 100$$

R_n = rate of return on net worth
P = net profit
Q = Net worth

1.4.3 Net Profit/Total investment Cost (Fixed Asset + Pre-production cost + working capital): is to measure the project profitability vis a vis the total investment cost (fixed assets + pre-production cost + working capital)

$$R = \frac{P + I}{K} \times 100$$

K = Total investment
I = Interest charges
R = rate of return on total investment cost
P = Net profit after depreciation, interest charges and taxes.

SPECIFIC INVESTMENT COST: is defined as (Total investment cost - working capital)/Production output. It is to measure how much each unit of production output necessitate in fixed investment cost. In other words the efficiency of the investment cost put into this technology example

[illegible] million [illegible] investment
[illegible] ton.

1.6 SPECIFIC PRODUCTION COST: Is defined as or as it fit before tax or taxable profit/production output. It is to measure the efficiency of the production process. Example

$\frac{\$\ 11.5\ \text{million}}{15,000\ \text{tons}}$ = $ 766 production cost per ton of cement.

1.7 TURNOVER: Relates the level of assets with output. It is defined as sales/total assets. Turnover of a food project is different from Turnover of a jewellery project.

2. TIME RISK ANALYSIS

2.1 PAY-BACK PERIOD: The pay-back period is defined as the period required to recuperate the original investment outlay through profits earned by the project. "Profit" is defined as net profit after tax, plus financial cost and depreciation. Consumption usually start with the construction period during which the initial investments will be made.

A project proposal may be accepted if the pay-back period is smaller than or equal to an acceptable time period.

The shortcoming of pay-back method is that it gives no consideration to the time of the cash flow and hence, the time value of money, within the pay-back period or even to any cash flows that might accrue after the pay-back period. Furthermore, it does not measure the profitability of the project.

INVESTMENT PROFITABILITY
SIMPLE METHODS

SIMPLE RATE OF RETURN

$$R = \frac{\text{NET PROFIT} + \text{INTEREST}}{\text{TOTAL INVESTMENT COSTS}}$$

$$R_e = \frac{\text{NET PROFIT}}{\text{EQUITY}}$$

YEAR 6	YEAR 8
$\frac{(2544+176)\times 100}{10300} = 26\%$	$R = \frac{(1360+0)\times 100}{10300} = 13.2\%$
$= \frac{25400 \times 100}{5800} = 43.8\%$	$R = \frac{1360 \times 100}{5800} = 23.4\%$

INVESTMENT PROFITABILITY
SIMPLE METHODS
PAY-BACK PERIOD

PAY-BACK PERIOD /PAY-OUT/ = The time it takes to recover the investment costs through profits* earned.

*Profit = net profit after tax + financial cost + depreciation.

		Amount paid back (Profit)	Balance end year
Year 1	construction	—	10300
-"- 2	construction	—	10300
-"- 3		870	9430
-"- 4		2030	7400
-"- 5		2330	5070
-"- 6		3500	1570
-"- 7		3500	-

PAY-BACK PERIOD = 6.5 years

CONSTRUCTION PERIOD NOT INCLUDED } PAY BACK = 4.5 years

II - FINANCIAL ANALYSIS

(Financial ratio)

1. LIQUIDITY RATIOS

1.1 CURRENT RATIO: is defined as current asset/current liabilities. It measure the ability of the project to meet its current liabilities due within one year from the current assets. Rough measure (inventory not so liquid).

1.2 QUICK (ACID TEST) RATIO: is defined as

$$\frac{\text{current assets - inventories}}{\text{current liabilities}}$$

It is to measure the highly liquid asset to meet current liabilities.

1.3 RECEIVABLES TURN-OVER AVERAGE (COLLECTION PERIOD): It measures the average time necessary to collect the receivables. It is defined as: Annual credit sales/average receivable outstanding

OR a more useful approach

$$\frac{\text{Average (or year end) level of receivables} \times 365}{\text{Annual credit sales (or annual sales)}} = \text{days}$$

1.4 INVENTORY TURNOVER: It measures how many time a year inventory is turned-over. It is defined as: Cost of goods sold or factory cost/average inventory = ? times. It reveals a slow moving inventory or even when inventory is obsolete, or it necessitate to reduce price to liquidate inventory. It might suggest that inventory is over-valued.

Another approach is

1.5 AVERAGE PAY'S INVENTORY: It measures the time necessary for the inventory to be liquidated. It is defined as

$$\frac{\text{Average inventory} \times 365}{\text{cost of goods sold}} = \text{??? days}$$

1.6 BASIC DEFENSIVE INTERVAL: It measures the ability of the project to meet its most pressing obligations. It is

defined as cash + marketable securities + receivables/ daily operating expenditures. Daily operating expenditures are determined by summing all cash operating expenses of the year (cost of goods sold+ selling, general and administrative expenses) and dividing by 365.

2. FINANCIAL LEVERAGE

2.1 LONG TERM DEBT TO EQUITY RATIO: It measures the financial risk that a project faces and compares borrowed long term loan and owned funds. It is defined as long term debts (of all kind) to total equity.

2.2 TOTAL DEBT TO EQUITY RATIO: It measures the financial risk that a project faces and compares total borrowed long and short term funds to owned funds. It is defined as Total debt to total equity.

... SHAREHOLDERS EQUITY/TOTAL LIABILITIES + NET WORTH: It measures the financial risk that a project faces and assess the portion of the shareholders' equity to the total liabilities + net worth.

3. COVERAGE RATIO

3.1 INTEREST COVERAGE: It measures how many times interest requirement on long-term debt is being met. It is defined as:

$$\frac{\text{Net income plus depreciation taxes and interest on long term debt}}{\text{Long-term debt interest requirement.}}$$

3.2 LONG-TERM DEBT SERVICES COVERAGE: It measures how many times interest plus long term debt repayment is being met. It is defined as:

$$\frac{\text{Net cash flow + debt service for interest + loan repayment + tax + dividend}}{\text{Long-term debt interest and debt repayment requirement.}}$$

4. EQUITY RATIOS

4.1 EARNINGS PER SHARE: It measure the earning per each share of the project.

It is defined as:

$$\frac{\text{Net income available to common shareholder}}{\text{number of common share issued}}$$

4.2 DIVIDENDS PER SHARE: It is the payout to each share. It is defined as: Common Dividends paid/number of common shares issued.

4.3 PAYOUT: It is the ratio of the paid dividend or proposed to be paid dividend to the total earning. It is defined as: Total Dividends/total earning

4.4 PRICE-EARNINGS RATIO (P/E): It is the ratio of the market price of a share to its earning. It is defined as: Market price of a share/its earning.

5.5 YIELD ON COMMON SHARE: It is the ratio of the common dividend to the market price of a share. It is defined as: Dividend per share/market price per share.

5.6 BOOK VALUE PER SHARE: It gives the value of each share as per the accounting book of the firm. It is defined as: Common shareholders' equity/number of common shares issued.

UNIDO TRAINING WORKSHOP SEMINAR

IN INDUSTRIAL PROJECT

PREPARATION, EVALUATION AND FINANCING

Prepared by

T. O'FALY

FINANCIAL EVALUATION UNDER UNCERTAINTY

(April 16 - May 4, 1984)

IN

HAVANA - CUBA

FINANCIAL EVALUATION UNDER UNCERTAINTY

Forecasts of demand, production and sales may not be exact due to uncertainty about the future. The most common reasons for uncertainty are inflation, changes in technology, false estimation of the rated capacity. When dealing with an investment under conditions of uncertainty 3 variables should be examined:

- Sales Revenues
- Production cost, and
- Investment cost

Uncertainty analysis can be analysed by 3 methods:

1. THE BREAK-EVEN POINT (B.E.P)

Break-even analysis determines the break-even point at which sales revenues equal production cost. It can also be defined in Terms of number of physical units to be produced, or the level of capacity utilization at which sales revenues and production cost match each other.

Sales Value $= Y = P X$

Production cost $= Y = VX + F$

$PX = VX + F$

Thus: $X = \frac{F}{P - V}$ Physical units to be produced and sold

Example: $BEP = \frac{3280}{6.25 - 3.25} = 1093$ units

High BEP render a firm vulnerable to changes in production level

Expressed in terms of Sales Revenues it becomes

$$X = PX \frac{F}{P - V}$$

Example: $BEP = 6.25 \times \frac{3280}{6.25 - 3.25} = \$\ 6,833$

Another form of BEP is the capacity utilization

$$BEP = \frac{F}{r - v}$$

where F = fixed cost

V = Variable cost and

r = is the sales revenue at full capacity.

Example =

$$BEP = \frac{3280}{12,500 - 6,500} = 55\% \text{ capacity utilization}$$

Several BEP can be calculated based on different alternative investment and installed capacities.

2. Sensitivity Analysis

Sensitivity analysis is introduced to sensitise the project outcome as a result of a possible change in:

- The per unit sales
- The sales volume
- The per unit cost of production - (change in: labour cost / " raw material / energy)

an optimistic and pessimistic ranges the investors can have a better view of the possible future outcome. Or the study could be built on the most pessimistic probability.

Thus = assuming a reduction in the sales price in the previous example from 6.25 to 5.75 x (2 million units)

$$BEP = \frac{\text{Fixed Production cost}}{\text{Sales Revenue - variable production cost}}$$

$$BEP = \frac{3280}{11,500 - 6,500} = 66\%$$

applying the previous formula it is possible to find out the selling prices at which the project will break-even.

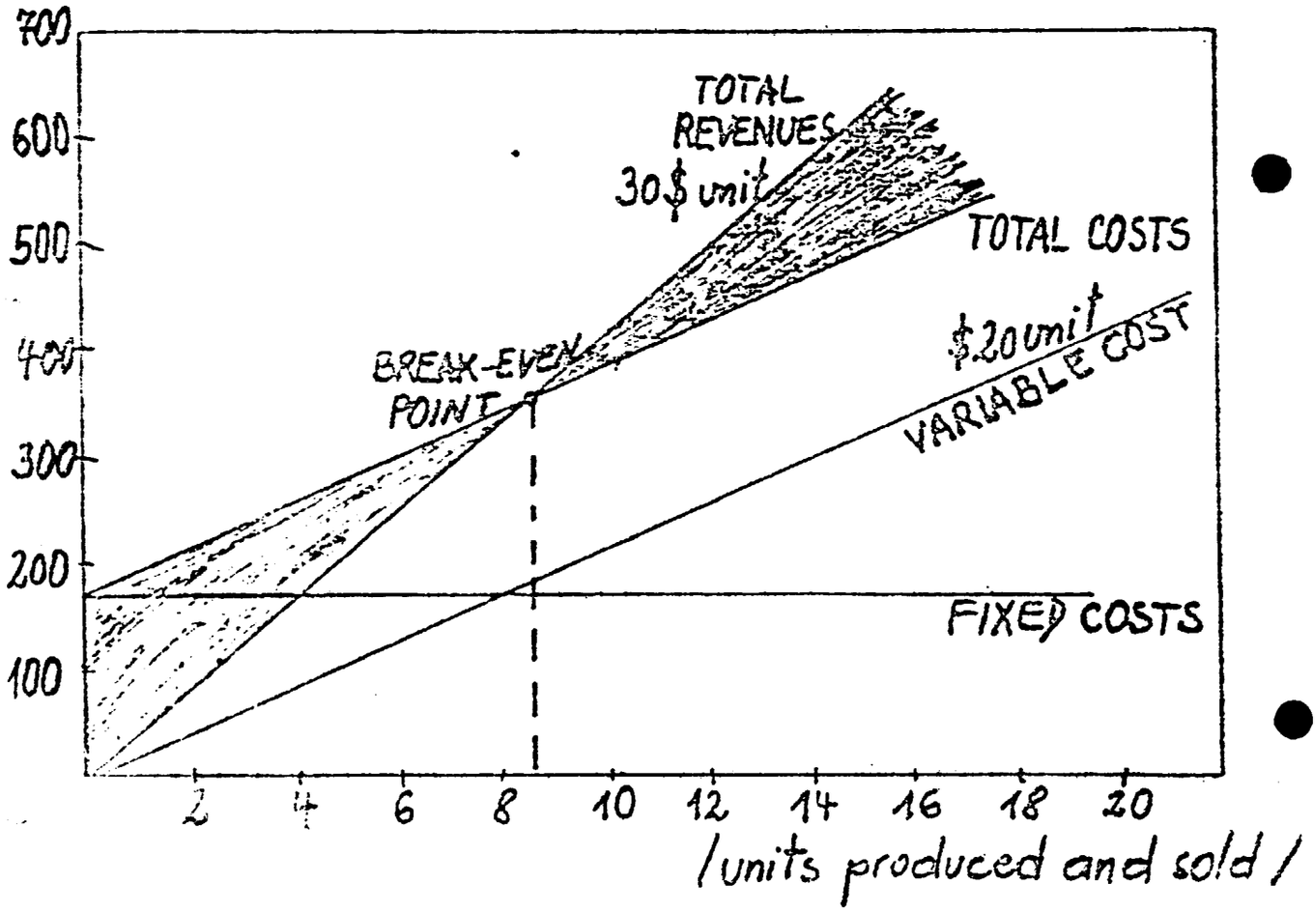
$$2,000 \times p = (\$\ 3.25 \times 2,000) + 3280$$

$$\therefore\ p = \$\ 4.9$$

Thus the safety margin is $\frac{6.25 - 4.9}{6.25} \times 100 = 21.8\%$ which can be used for price reduction during the initial period of market penetration.

BREAK-EVEN ANALYSIS

DETERMINES the BREAK-EVEN POINT (BEP) – the point at which sales revenues equal production costs.



SALES $Y = PX$

PRODUCTION COSTS $Y = VX + F$

$$PX = VX + F$$

$$X = \frac{F}{P - V} = \text{physical units produced and sold}$$

The same exercise could be repeated to sensitise change in the variable cost or fixed production cost in order to examine the range of possible outcome.

3. Probability analysis and risk assessment

It is carried out with the objective of attaining higher accuracy. It tries to determine the probability of occurence for each value of the variable which can have several values. Thus the number of computation are considerably increased and would usually require computer simulation programme.

Example:

Outcome	Probability
$ 80,000	.3
50,000	.5
30,000	.2

The mode value of the outcome would be $ 50,000

The mediam value of the outcome would also be $ 50,000

The mean value of the outcome distribution $ 55,000.

Thus the D.C.F. would be allocated to the probability occurance and the results would be following the whole procedure previously described to attain the IRR & NPV.

There is an inverse relationship between the investment value and the risk (probability occurence) associated with the payment stream generated by that asset. From the measure of central tendancy we can develop a measure of risk. The most frequently employed measure of dispersion around the central tendancy of a distribution is the standard of Deviation (σ) expressed as:

$$\sigma = \sqrt{\sum_{t=1}^{n} (O_t - u)^2 \, pt}$$

where

σ = Standard of deviation

O_t = The expected outcome

u = The mean

pt = The probability occurence

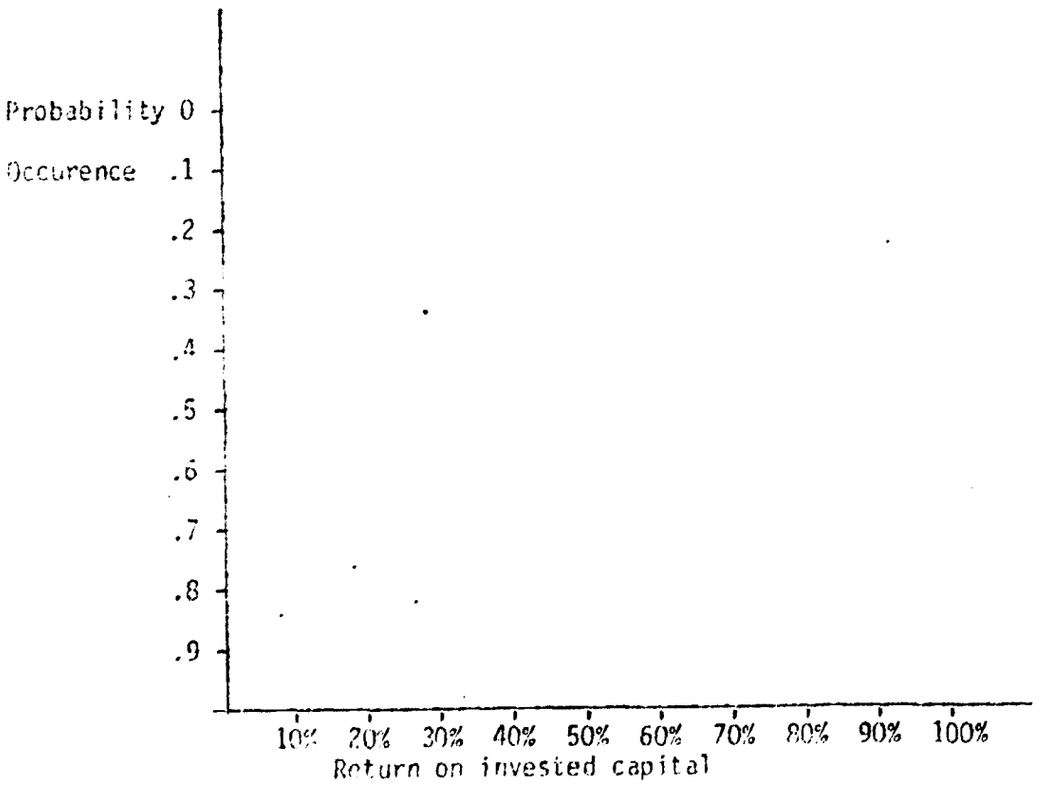
Applying the previous example we get

$O_t - u$			$(O_t - u)^2$	pt	
$ 80,000	- $ 55,000	= $ 25,000	$(25,000)^2$	= (625,000,000) x (.3)	= $187,500,000
50,000	- 55,000	= - 5,000	$(-5,000)^2$	= (25,000,000) x (.5)	= 12,500,000
30,000	- 55,000	= - 25,000	$(-25,000)^2$	= (625,000,000) x (.2)	= 125,000,000
					$ 325,000,000

$\sigma = \sqrt{\$\ 325,000,000} = \$\ 18,028$

The larger the standard deviation, the greater the risk associated with the distribution.

Another way to associate risk versus return is better explained on a graphical chart where the investor could plot his scale of preference of return versus risk.



ANNEX IV

H A N D O U T S

presented by Mr.O. Heinone

UNIDO SEMINAR 1974-04-19/20 MARKET STUDY

1. Sequence for analising the marketing aspects of the project feasibility.

2. Description of market diagnosis/prognosis.

3. Check-list of data required.

4. Data collection and processing.

Figure I. MARKET AND PLANT CAPACITY ANALYSIS FOR PROJECT's FEASIBILITY STUDY; A SEQUENCE:

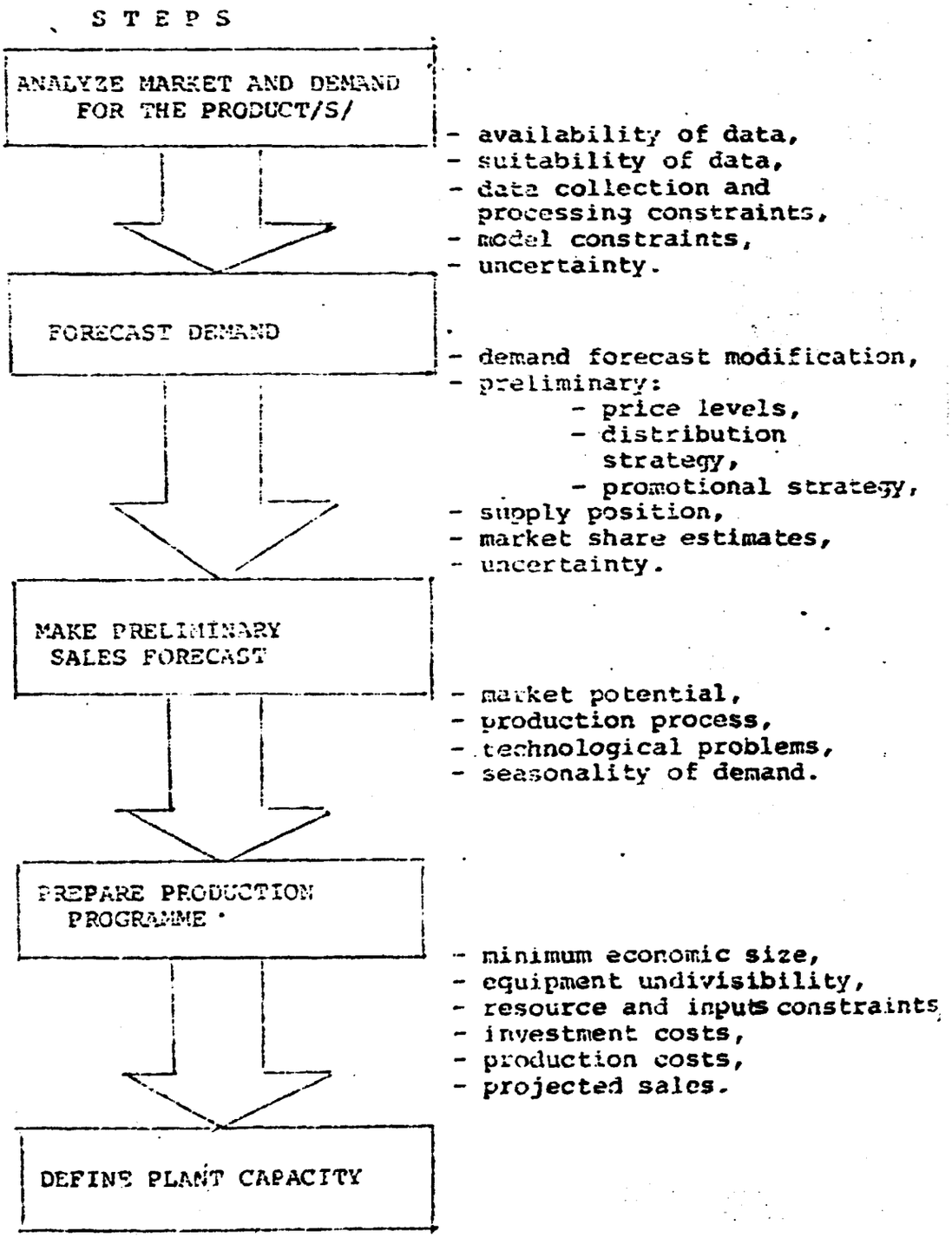


Figure II presents the standard procedure for demand and market analysis and forecasting. The outline of this procedure forms the backbone of discussion following in sections 2-10.A word of caution is perhaps necessary here. The practice of feasibility study preparation is largely an iterative procedure and therefore involves a number of back-and-forth steps. For example: the final sales projection cannot be made without a decision on specific price level, and this in turn cannot be made prior to analysis of production costs and break-even analysis, which will be conducted at the later stages. One should therefore deal with alternatives and never consider a particular stage as a closed compartment,to which there is no return once the next stage has been started.

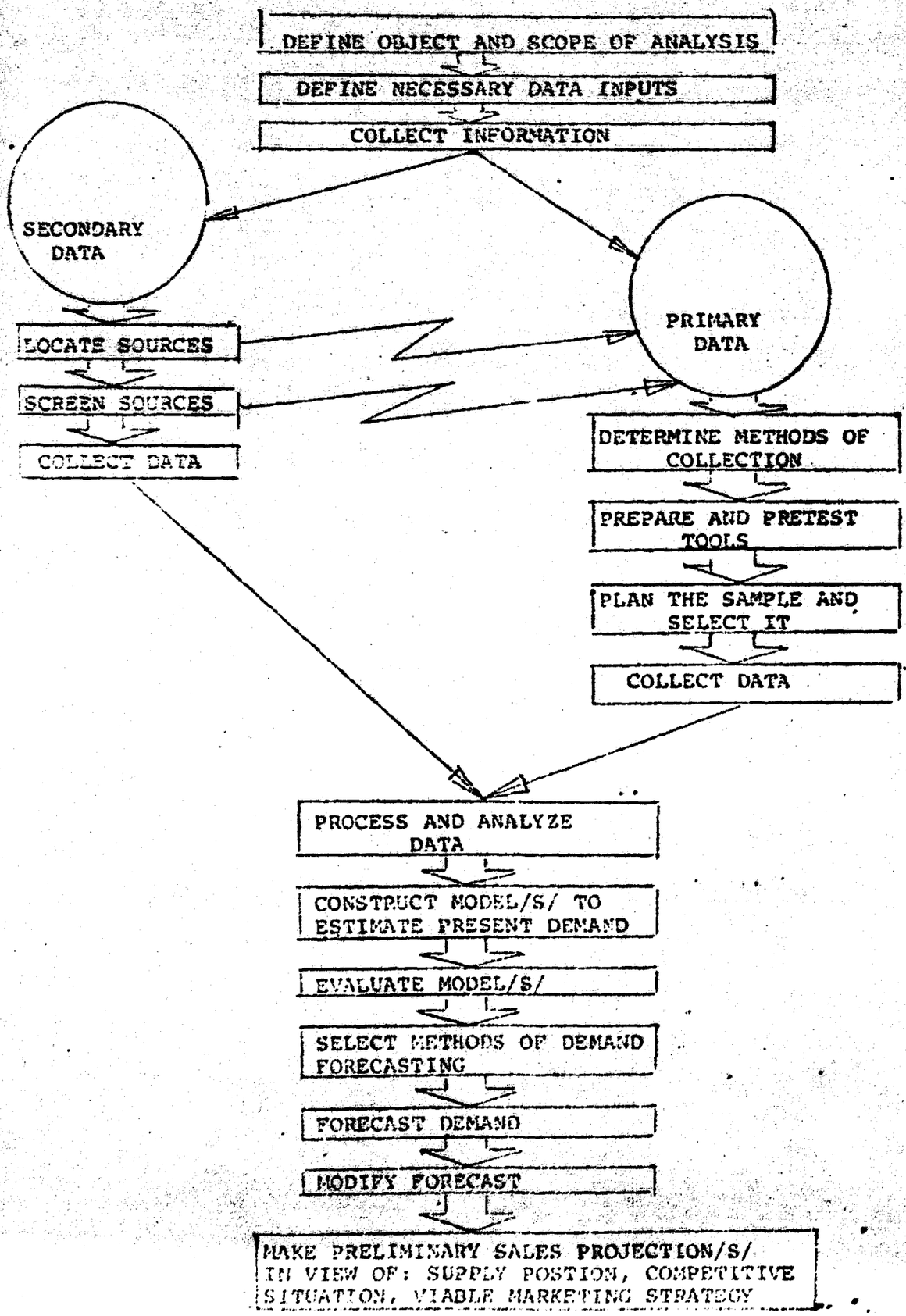
To avoid misunderstandings in following the text simple definitions of terms most likely to appear confusing are presented below. These definition will be consequently followed throughout the text:

1. Demand: the quantity of goods that buyers are ready to purchase at a specific price in a particular market at a given point of time.

2. Market: an arena for potential exchanges. Despite the common use of both these terms interchangeably. "market" will have broader meaning than "demand", encompassing all the complex factors affecting the process of exchange.

3. Sales: the quantity of product that is actually purchased at a specific price and under specific marketing strategy in a particular market at a given point in time.Thus the industry sales will practically equal effective demand in the absence of supply shortages but project's sales may be substantially

Figure II. PROCEDURE FOR DEMAND AND MARKET ANALYSIS AND FORECASTING



smaller than the demand in the given market, depending on the project's capacity, marketing strategy and position vis a vis competitors.

4. Marketing-mix: set of controllable market variables crucial to any marketing strategy i.e.: product, price, distribution, promotion.

5. Promotion-mix: set of tools in the marketing-mix whose major role is persuasive communication i.e. advertising, personal selling, publicity, sales promotion.

6. Selling: one part of promotion and promotion is one part of the total marketing programme.

7. Distribution: retailing and wholesaling structure - the channels used to get the product to the market.

8. Physical distribution: materials-flow activities such as transpo. ation, warehousing and inventory control.

A check-list of data inputs for demand and market analysis:

(1) General economic indicators:

- area and climate,
- population (size and composition),
- resources,
- gross domestic product (size, dynamics, basic structure),
- industrial production (total and by sectors),
- geographic location of basic industries,
- ownership structure,
- exports (size, dynamics, structure),
- imports (size, dynamics, structure),
- balance of trade and balance of payments.

This should cover only information relevant to the specific product(s) under consideration (e.g. aggregate variables significant to the demand determining factors). General economic indicators should only present basic macro-economic framework within which the specific market functions.

(2) Data on product:

- product features: technical data on product, quality, sizes, colour, package, brand, label, perishability, bulkiness, etc.

- product classification (see II, p. 14)

- product uses (single or multiple-use products)
- complementary and substitute products' description.

This data should supply information not only on the envisaged project's product(s) but also on market tastes, requirements and preferences. Combined with information on demand patterns (3) it should provide basis for modification of the original product idea in line with the specific market/sub-market detailed requirements that the project is designed to satisfy.

(2) Demand data:

- market size:
  - apparent consumption,
  - effective demand,
  - market saturation,
  - market potential,

- market segments:
  (see Section II : variables for market segmentation)

- determinants of demand:

- consumer markets:
  - general economic conditions,
  - demographic factors,
  - income (level, dynamics, distribution),
  - income elasticity of demand,
  - product price,
  - price elasticity of demand,
  - product obsolescence and fashion,
  - prices and availability of substitutes,
  - prices and availability of complementary goods,
  - cross-elasticity of demand,
  - behavioural patterns,
  - credit,
  - government policies,

- industrial goods:
  - general economic situation,
  - expected profit and market position,
  - price of the product
  - price elasticity of demand,
  - prices of substitutes,
  - technological progress,
  - number and types of industrial users,
  - buying power of industrial users,
  - credit,
  - government policies.

- composition of demand:
  - new v.s. replacement demand.

(4) supply data:

- local production:
  - size, dynamics, structure,
  - geographic distribution,
  - concentration level,
  - capacity utilization,
  - availability and prices of inputs,
  - investments, costs, profits,
- imports:
  - size, dynamics, importers characteristics,
  - quality,
  - price,
- exports
  - size, dynamics, geographical structure.

For more detailed discussion of reasons for collecting the above information see apparent consumption concept (p.19).

(5) Marketing environment:

- product:
  - particular segments' preferences as to the desirable product features,

- price:
  - price level and dynamics,
  - pricing policies and practices in the market,
  - standard markups,
  - customary discounts and allowances,
  - price competition,
  - legislation on pricing,

- distribution:
  - channels:
    - forms of ownership,
    - number and type of intermediaries,
    - marketing tasks that particular intermediaries can carry,
    - intermediaries' strengths and weaknesses,
  - physical distribution:
    - existing network's coverage and transportation routes,
    - types of carriers available,
    - costs of alternative routes and carriers,
    - warehousing system and costs.

- promotion:
  - existing promotional media,
  - most popular forms of promotion,
  - particular segments' susceptibility to different forms of promotion,
  - agencies,
  - costs.

This data is of particular importance to any marketing strategy developed for the product in question, however broad the strategy may be at this stage of the feasibility study. For more detailed discussion see VIII.

(6) Competition:

- types and intensity of competition,
- competitors' market shares,

- characteristics of major competitors,
- major competitors' (both: local and foreign) marketing strategies:
  - product features,
  - prices charged,
  - distribution channel arrangements,
  - transportation routes used,
  - promotional strategies,
- substitutes:
  - quality characteristic,
  - sales data,
  - availability (regional breakdown)
  - market responses (segment breakdown)
  - prices and other elements of marketing strategy.

Within the existing market institutions, pattern and restrictions the choice of the marketing strategy will, unless the market is fully protected, depend to a significant degree on the likely actions and reactions of the competitors. This type of information is particularly difficult to obtain and therefore the researcher will have to settle for much less comprehensive and consistent data than in the other aspects of the analysis.

(7) Government policies and legislation (not covered elsewhere) i.e.:

- investment incentives, credit facilities, tax holidays, market protection, subsidies,
- consumer credit, manipulating propensity to save, price control, taxes,
- tariffs and non-tariff barriers, quotas, customs duties,

- direct or indirect subsidies, foreign currency allocation, priorities for efficient exporters.

Data collected here should cover all aspects of government policy and legal considerations which the future project will have to reckon with. These are the constraints within which the project will have to operate and reasonable assumptions as to the future tendencies of the above constraints will have to be made.

The above checklist is applicable for a comprehensive export market analysis, as well as for the local one. Data on foreign market, collected along the presented enumeration should be supplemented by the following "export information" stemming from the specific character of foreign transaction.

(8) Terms and conditions of exporting:

- characteristics of specific intermediaries (exporter, importer),
  - general description of types available,
  - margins,
  - effectiveness,
  - reputation,
  - contacts in export market,
  - marketing tasks they are able and prepared to carry,
- transport and insurance:
  - traditional transportation means,
  - costs of freight and insurance,

- timing of delivery,
- delivery terms /c.i.f., c.a.f., f.o.b., f.o.r., f.o.t., etc./

- market accessibility:
  - tariffs and fees,
  - non-tariff barriers:
    - quality standards,
    - health and medical requirements,
    - package standards,
    - import quotas,
    - customs regulations,
    - political and administrative barriers,
  - trading habits,
  - terms and conditions of payments.

Whenever possible, apart from past and present information, available future plans, projections and perspectives should also be collected. The reliable sources in this respect are:

- national and sectoral development plans and programmes,
- macro-economic forecasts by reliable institutions,
- projects under construction.

IV. DATA COLLECTION AND PROCESSING

After having defined and described in detail the necessary data inputs the next step in the analysis is to organize for data collection process. Secondary data sources should be searched for and scrutinized first, since - compared with primary data - this category has the advantage of being:

- cheaper,
- less time consuming,
- easily available.

Secondary data, i.e. information that has been collected and compiled by some person or agency for purposes other than the solution of the problem at hand, can be broken down into:

- internal secondary information - the only source of which is the company/project for which the research is conducted, i.e.:
  - financial statements,
  - sales records,
  - file of consumers' orders,
  - sales compensation records,
  - sales expense records,
  - salesmen reports,
  - others: price lists, customer correspondence, etc.
- external secondary information, the sources of which are:
  - censuses and official government statistics,
  - international statistics,
  - official publications produced by United Nations agencies, OECD, GATT, EEC and other organizations,
  - reports published by international and regional organizations,
  - reports published by banks and other local organizations,

- encyclopaedias and other publications,
- customs regulations and tariffs,
- professional papers and journals,

other sources: trade associations, publishers, universities, government and private agencies, bibliographies, indexes etc.

At this stage of feasibility study there is precious little, if at all, internal data generated, unless the project under study is the extension of the one already existing and operating in the market. The bulk of infomation comes therefore from external secondary sources.

Such data is seldom complete for the purpose of a market study but constitutes an effective starting point. It is common, in many developing countries, for data to be available on general economic indicators but be inadequate or not readily available on existing production figures. In some developing countries such information is considered confidential as far as production in particular industrial enterprises is concerned. Import data are, of course, available from governmental agencies, but are not always accessible. In many cases, a number of items are lumped together; disaggregation is difficult, and figures cannot be identified for detailed product classifications and sub-classifications. Data on inventories are difficult to obtain, except for certain products in respect of which there are official publications.

Despite its obvious advantages, one should not therefore be uncritical in using secondary data for research purposes. Available information should be carefully scrutinized with respect to:

- the character of collector and/or sponsoring organization,
- the objectives of the original study,

- the metods employed in collecting and processing of data,
- classifications and definitions used,
- data aggregation,
- timeliness.

In the process, some of the secondary data sources will be screened out.

The need for primary data i.e. information collected for the first time to the researcher's knowledge, can be defined, after specifying the necessary data inputs for analysis, in order to cover the problem areas for which secondary data is known to be unavailable, incomplete or unsuitable or to supplement secondary information. The above screening proces may, however, result in increasing the originally required primary data inputs as a consequence of rejecting some secondary sources previously considered to be reliable. This process is indicated in Figure II by cross-arrows.

The overall primary data requirements cannot therefore be assessed before screening of secondary data sources is completed.

There are three types of primary data:

- facts-those things that have objective existence,
- opinions - beliefs, attitudes, evaluations, estimates, preferences,
- motives - why people do what they do.

All these types should be sought after, as explained in Section III.

Primary data collection methods can be classified into:

- survey - data obtained in response to questions,
- observation - what is taking place is seen and recorded,

- experimentation - active character of the situation creation /market test/,

Market experiments /tests/ are not viable at this stage of feasibility study as they involve effective experimentation with product versions, packaging, advertising, prices etc. in the selected test areas /test markets/.

Observation in the forms of audits or watching people's behaviour by trained observers may be useful; although it should, as a rule, be supported by questionnaire to discover motives of observed behaviour. Another form of observation, involving hidden cameras, counting meters etc., is practically not applicable in the developing countries due to unavailability of recording devices.

Survey appears by far the most widely used method of primary data collection in the developing countries. Market surveys are to a great extent based on questionnaires as methods of obtaining specific information about a defined problem. Questionnaires may be administered by:

- personal interview,
- mail,
- telephone.

The forms of a questionnaire will vary from a set of formal questions designed to obtain limited, precoded answers that can be easily processed by the machine /as in the case of a structured interview/ to a scanty "interviewing guide", outlining only the type of information being sought by the interviewer /non-structured interview/. In the latter, extreme case the wording of questions, as well as their sequence, is left to the interviewer's discretion and depends on the course of development of an interview as well as the personality and reactions of the respondent.

UNIDO SEMINAR, RAVANA 1984-4-24

O. HAINONEN

MARKET SHARE

1. Can be measured reliably only if you define the market as a group of end-users/consumers with common characteristics, e.g., Mexican newspaper (morning-evening) publishers.

2. Correlates positively with return of investment.

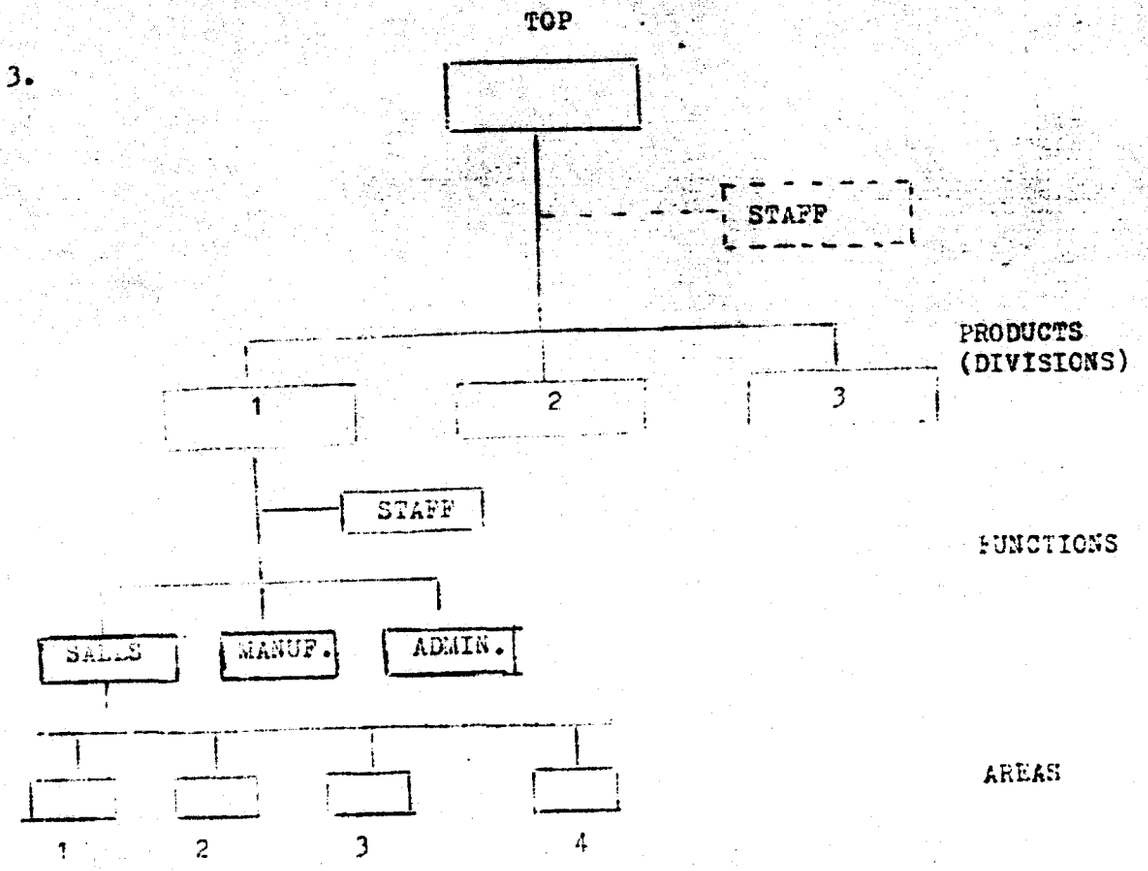
3. Influences the learning curve and reduces the cost, e.g.
   - production
   - marketing
   - distribution
   - administration overhead

4. Increases the rate of profit and { receivables / inventory turnover .

5. Increases the cost of R.&D.

6. Is positively influenced by balance between quality, price and non-price competitive measures.

3.


TOP
STAFF
PRODUCTS
(DIVISIONS)
1
2
3
STAFF
FUNCTIONS
SALES
MANUF.
ADMIN.
AREAS
1
2
3
4

UNIDO SEMINAR, HAVANA 1984-04-24

O. HEINONEN

MARKET SHARE

1. Can be measured reliably only if you define the market as a group of end-users/consumers with common characteristics, e.g., Mexican newspaper (morning-evening) publishers.

2. Correlates positively with return of investment.

3. Influences the learning curve and reduces the cost, e.g.
   - production
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   - distribution
   - administration overhead

4. Increases the rate of profit and { receivables / inventory turnover .

5. Increases the cost of R.&D.

6. Is positively influenced by balance between quality, price and non-price competitive measures.

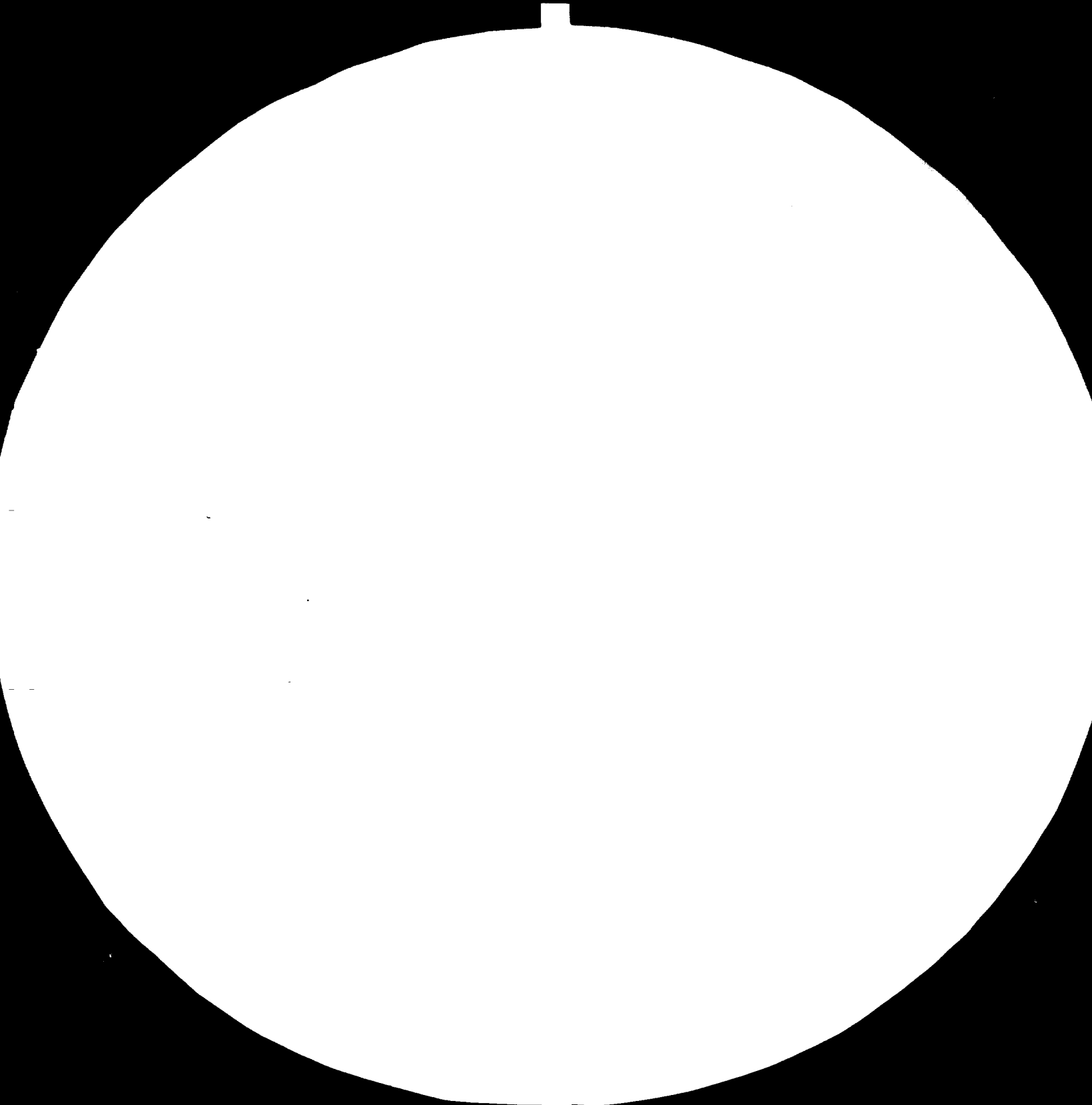
UNIDO SEMINAR 1984-IV-[illegible] / MARKET STUDY

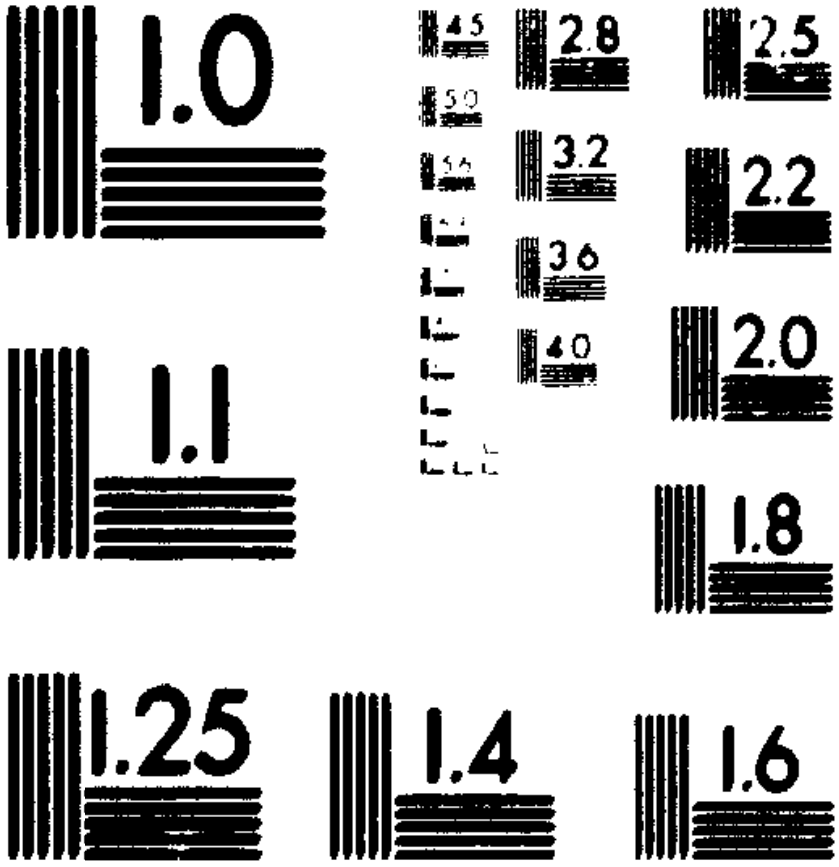
[illegible]

1. Correlation between GNP (NMP) per capita and paper consumption per capita.

How do you explain the following ratios?

	GNP (NMP) PER CAPITA			PAPER CONSUMPTION/PER CAPITA		
COUNTRY	YEAR	AMOUNT/USD	INDEX	YEAR	AMOUNT/Kg.	INDEX
CUBA	1979	1410	100	1980	20	100
FINLAND	1980	9720	689	1980	162	810
GDR	1980	7180	509	1980	81	405
DENMARK	1980	12950	918	1980	142	710
INDIA	1980	240	17	1980	3	15
USA	1980	11360	806	1980	276	1380
HOLLAND	1980	11470	813	1980	154	770





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No. 2)

ANNEX IV

H A N D O U T S

presented by Mr.W. Hübner

W. HÜBNER

Demand forecasting techniques - general orientation

A. Stages of projecting the future demand for project's output:

1) identification of data related to demand in the past;

2) defining of a mathematical expression which explains the best movements of demanda in the past;

3) application of this mathematical expression in order to project the future demand;

4) interpretation of results obtained when projecting the future demand by applying a given method;

5) comparative analysis of the results produced by application of different methods for demand projections.

B. Methods of demand projection:

1. Average annual rate of growth.

$$I_t = \frac{Y_t}{Y_{t-1}}$$

where:

I_t - index of demand movements,

Y_t - demand in the year "t"

Y_{t-1} - demand in the year prior to "t"

2. Decomposition of time-series:

- trend
- cyclical fluctuations
- seasonal fluctuations
- random (irregular) variations

2. . Linear trend

$$Y = a + b\,x$$

where a, b – parameters of the trend equation,

$$x = \text{time}$$

$$b = \frac{\sum x\,Y - N\,\bar{x}\,\bar{y}}{\sum x^2 - N\,\bar{x}^2} \qquad a = \bar{y} - b\,\bar{x}$$

where: $\bar{x}$ = the arithmetic mean of the number of years;

$\bar{y}$ = the arithmetic mean of the annual values of demand;

N = the number of years

The "least squares" method.

Criterion: $$\sum_{i=1}^{n} (Yi - Yi)^2 \longrightarrow \min$$

The idea of fitting the algebraic trend curve to the scatter of points depends on the "line of the best fit" for the specific set of data. Such a line should satisfy the criterion of " least squares" – i.e. the sum of squared differences between actual data points (Y_i) and corresponding trend points (Y_i^h) ought to reach minimum for "best fit line" as compared with other "potential" trend curves.

The curve of the first degree presents a linear trend, the curves of second and higher degree are related to non-linear trends

2.2. Expotential (semi-log) trend:

$$Y = ae^{bx} \qquad \text{or} \qquad \log Y = a + bx$$

2.3. Second and higher degree polynominal trends:

$$\text{eq. } Y = a + bX + c\,X^2$$

2.4. Double-log (Cobb-Douglas) function:

$$Y = a\,X^b \quad \text{or} \quad \log Y = \log a + b \log X$$

3. Regression analysis:

   3.1. Identification of variables.

   3.2. Carrying out the regression analysis – finding the mathematical expression which describes the relation between dependant and independant variables. Trial and error procedure.

   3.3. Projection of the future demand.

   3.4. Interpretation of the results

4. Consumption level method:

5. – Income elasticity of demand

$$E_I = \frac{Q2 - Q1}{I_{p2} - I_{p1}} \times \frac{Ip1 + Ip2}{Q_2 + Q_1}$$

where:

Q_1 – quantity demanded in the base year,

Q_2 – quantity demanded in the subsequent year,

I_{p1} – per capita income in the base year,

I_{p2} – per capita income in the subsequent observation year

– Price elasticity of demand

$$E_p = \frac{Q1 - Qo}{Po - P1} \times \frac{Po + P1}{Q1 + Qo}$$

where:

P1 – the new price,
Po – the present (base) price,
Qo – the demand at price Po,
Q1 – demand at the new price.

- Cross elasticity

$$C_{AB} = \frac{Q_{2A} - Q_{1A}}{Q_{2A} + Q_{1A}} \Big/ \frac{P_{2B} - P_{1B}}{P_{2B} + P_{1B}}$$

C_{AB} – the cross elasticity of product A to product B

$C_{AB} > 0$ – substitution for A

$C_{AB} < 0$ – complementary to A

$C_{AB} = 0$ – no cross elasticity

6. End use or consumption coefficient method.

a) identification of possible uses

b) estimation of input – output coefficient

7. Leading indicator method

References: Manual for the Preparation of industrial Feasibility Studies: pp 48–50; Annex VI.

P.E. Green, D.S.Tull – Research for Marketing Decisions, Prentice-Hall, 1978 (for advanced readers)

N. Hübner Regression analysis - practical examples [1]

Different models of functional relationship

Historical series of per capita consumption of paper and board in the years 1948-59 were correlated with the per capita income (GNP) assuming three different models of functional relationship between the variables:

A) Assumption that, as income grows, increasing amounts of paper and board will be bought for every new dollar earned (constant percentage change of the consumption at a given rate of change in income)

$$\log y = a + b \log x$$

where y = consumption per capita

x_2 = GNP per capita

B) Assumption that constant amounts will be bought for every new dollar earned.

$$y = a + bx$$

C) Assumption that marginal propensity to consume will increase but at a slower rate than in A

$$\log y = a - \frac{b}{\log x}$$ (hyperbolic- logarithmic function)

1/ From: Pulp and paper prospects in Western Europe, FAO/BLV Gmbh, Munich, 1963.

These 3 alternative functional relationships between consumption and income all have shown an excellent fit to the historical data. The results, however, differ very much.

Comparison of 1969 to 1975 increases in paper and board requirements in Western Europe projected from historical (48-59) consumption/ income series.

	Regression function			Percent difference	
	A	B	C	A:B	A:C
Total paper and board*/	53.7	38.6	44.4	39	21
Cultural papers	20.7	15.3	17.3	35	20
Newsprint	12.7	8.4	10.4	52	22

*/ The figures show an increase 1960-75 in kg. per capita

Table 1 - Value of variables during the period 1968-1980

Year	Number of cars	Population in 000	Households in 000	Gross National Product in Millions of Dinars
1	2	3	4	5
1968	253.344	19.644	5.169	177.511
1969	355.875	19.840	5.221	191.520
1970	439.892	20.029	5.271	188.173
1971	562.509	20.209	5.318	206.339
1972	720.874	20.371	5.361	217.947
1973	875.365	20.572	5.414	235.540
1974	1,001,506	20.772	5.466	245.547
1975	1,140,532	20.963	5.517	257.684
1976	1,332.972	21.569	5.569	279.685
1977	1,536.677	21.365	5.622	289.893
1978	1,732.131	21.573	5.677	301.191
1979	1,923.904	21.780	5.732	325.321
1980	1,863.155	21.974	5.783	347.799

EXERCISE:

1) Using figures from table 1, estimate parameters of the linear trend

$$Y = a + b\,x$$

describing the demand for passenger cars in country -A in the given period.

2) Applying the linear trend estimate the demand for passenger cars for 1985.

W. Hübner

Demand forecasting - exercise

Solution

Y_{85} = 164 691 + 148 790,3 . X

Y_{85} = 164 691 + 148 790,3 . 17

Y_{85} = 2 693 526,1

Interpretation

1. Demand projections in the national plan?
2. Other projections?
3. Relative saturation of demand - the levels at which demand is being satisfied?
4. Slower demand growth - limiting factors in the product's environment?
   - situation in the balance of payments
   - purchasing power of the population
   - etc. etc.

Regression analysis

[illegible] [illegible]

[illegible]

Demand forecasting

Exercise

Information

The data collected have suggested correlation between demand X_1 for commodity i=1 and its price $P=X_2$, as it is presented below:

N	X_1	X_2	X_1^2	X_1X_2	X_2^2
.					
.					
.					
.					
5					
Σ	10	15	25	35	50

Problem

[illegible] parameters of the demand equation:

$$X_1 = \alpha_1 + \alpha_2 X_2 + \varepsilon$$

where: ε = random error,

X_1 = stochastic dependent variable (demand),

α_i = unknown constants

X_2 = independent variable (price).

Probability of occurrence of parameters α_0 and α_2 should equal 0.99

Solution

The set of so-called "normal equations" in this case will be:

$$\bar{X}_1 = a_0 + a_2\bar{X}_2$$

$$S_{21} = a_2 S_{22}$$

We may compute from the given table:

$$\bar{X}_1 = \frac{\sum x_1}{N} = \frac{10}{5} = 2$$

$$\bar{X}_2 = \frac{\sum x_2}{N} = \frac{15}{5} = 3$$

Elements Sij may be computed by the general formula:

$$Sij = \sum X_i X_j - N \bar{X}_i \bar{X}_j$$

$$S_{21} = \sum X_1 X_2 - N \bar{X}_1 \bar{X}_2 = 25 - 5.2.3 = -5$$

$$S_{22} = \sum X_2^2 - N \bar{X}_2^2 = 50 - 5.9 = 5$$

Hence; the normal equation will be:

$$2 = a_0 + a_2 \cdot 3$$

$$-5 = a_2 \cdot 5 \quad \rightarrow a_2 = -1 \; ; \; a_0 = 5$$

$$X_1 = 5 - X_2$$

Under stochastic conditions:

$$P\left\{a_0 - t_{\gamma/2;\mu} \cdot D(a_0) < \alpha_0 < a_0 + t_{\gamma/2;\mu} \cdot D(a_0)\right\} = 0{,}95$$

value of $t_{\gamma/2;\mu}$ may be found in the t-student table

($\gamma/2 = 0{,}5$; $f(= N - n = 3$,

where : N = number of observations,

n = number of estimated parameters)

$t_{\gamma/2;\mu} = 3{,}182$: estimates of standard errors of estimators of the parameters:

$$D(a_0) = \frac{Se}{\sqrt{N-n}} = \frac{1}{\sqrt{3}} = \frac{2}{\sqrt{3}} \approx 0{,}58$$

where: $Se^2 = \frac{1}{N-n}\left(S_{11} - a_2 \cdot S_{12}\right) = 1$;

$S_{11} = 38 - 30 = 8$

$$P\left\{5 - 3{,}182 \cdot 0{,}58 < \alpha_0 < 5 + 3{,}182 \cdot 0{,}58\right\} = 0{,}95$$

$$P\left\{3{,}1 < \alpha_0 < 6{,}85 = 1{,}95\right\}$$

α_0 is estimated within $\langle 3{,}5 \; ; \; 6{,}5 \rangle$

with the probability of 0,95

The same method is applied to α_2 :

$$D(a_2) = S_e \cdot \sqrt{S^{22}} = S_e \cdot \frac{1}{\sqrt{S_{22}}} = 1 \cdot \frac{1}{\sqrt{2}} \approx 0{,}45$$

$$P\left\{-1 - 3{,}182 \cdot 0{,}45 < \alpha_2 < -1 + 3{,}182 \cdot 0{,}45\right\} = 0{,}95$$

$$P\left\{-2{,}43 < \alpha_2 < 0{,}44\right\} = 0{,}95$$

The "null hypothesis" for α_2 :

$$H_0 : \alpha_2 = 0$$

$$\frac{\alpha_2 - a_2}{D(a_2)} = \frac{0 + 1}{\frac{1}{\sqrt{5}}} = \sqrt{5} \approx 2.24$$

$$2.24 < 3.182 \quad \text{for } t_{0.05;\,3}$$

Thus, there is no reason to eliminate the hypothesis that $\alpha_2 = 0$; however, in this case such a conclusion may be due to a very limited number of observations.

Tablica Studenta

N - n	(1 - γ) (dwustronnie)			
	5%	2%	1%	0,1%
1	12,71	31,82	63,66	636,6
2	4,303	6,965	9,925	31,6
3	3,182	4,541	5,841	12,92
4	2,776	3,747	4,604	8,610
5	2,571	3,365	4,032	6,869
6	2,447	3,143	3,707	5,959
7	2,365	2,998	3,499	5,408
8	2,306	2,896	3,355	5,041
9	2,262	2,821	3,250	4,781
10	2,228	2,764	3,169	4,587
11	2,201	2,718	3,106	4,437
12	2,179	2,681	3,055	4,318
13	2,160	2,650	3,012	4,221
14	2,145	2,624	2,977	4,140
15	2,131	2,602	2,947	4,073
16	2,120	2,583	2,921	4,015
17	2,110	2,567	2,898	3,965
18	2,101	2,552	2,878	3,922
19	2,093	2,539	2,861	3,883
20	2,086	2,528	2,845	3,850
21	2,080	2,518	2,831	3,819
22	2,074	2,508	2,819	3,792
23	2,069	2,500	2,807	3,767
24	2,064	2,492	2,797	3,745
25	2,060	2,485	2,787	3,725
26	2,056	2,479	2,779	3,707
27	2,052	2,473	2,771	3,690
28	2,048	2,467	2,763	3,674
29	2,045	2,462	2,756	3,659
30	2,042	2,457	2,750	3,646
40	2,021	2,423	2,704	3,551
50	2,009	2,403	2,678	3,495
60	2,000	2,390	2,660	3,460
80	1,990	2,374	2,639	3,415
100	1,984	2,365	2,626	3,389
200	1,972	2,345	2,601	3,339
500	1,965	2,334	2,586	3,310
	1,960	2,326	2,576	3,291
(N - n)	2,5%	1%	0,5%	0,05%
	1/2(1 - γ) (jednostronnie)			

Wartość γ dla danego stopnia swobody (N - n) oraz prawdopodobieństwa (1 - γ).

A.) Long term trends

These are recorded over a long period and such a graph would be called a historigram and would show basic data on graph paper over a " long " period. " Long " needs to be interpreted within the context of the data under review. Trends are established statistically by calculating moving averages over years as in the following table.

Year	Data	3 yrs total	3 yrs moving average	Variation from trend col. 2-4
1969	12			
1970	10	39	13	-3
1971	17	45	15	+2
1972	18	48	16	+2
1973	13	51	17	-4
1974	20	54	18	+2
1975	21	60	20	+1
1976	19	63	21	-2
1977	23			

Special attention must be paid to the plus and minus signs. It must be remembered that it is the actual data which is varying from the trend.

B.) Cyclical movements

These should be isolated in a similar way to the trend except that a further stage is added by taking averages of the trend. Using the data from sub-section A on long term trends where a 3 year moving average was calculated we have:-

		Variations from the trend
Years 1	1969	-
	1972	+2)
	1975	+1) $\div$ 2 = + 1.5

		Variations from the trend	
Years 2	1970	-3)	
	1973	-4)	÷ 3 = -3.0
	1976	-2)	
Years 3	1971	+2)	÷ 2 = 2.0
	1974	+2)	
	1977		

The final figures give the cyclical variations. Obivously, it is better to make such calculations over as long a period of time as is feasible.

c.) Seasonal variations

These are variations within the year, hence " seasonal ". The variations are isolated by taking a series of moving averages within the year. The basic data, therefore, should be weekly, monthly or quarterly. The following tables show the compilation of seasonal variations based on quarterly data.

Year	Quarters	Data	4 qutr totals	Centred totals	Moving average (÷ 8)	Variation from trend col 3-6
1975	1	5.2				
	2	6.8	28.5			
	3	9.1	27.4	55.9	7.0	+ 2.1
	4	7.4	26.3	53.7	6.7	+ 0.7
1976	1	4.1	25.4	51.7	6.5	- 2.4
	2	5.7	24.5	49.9	6.2	- 0.5
	3	8.2	25.7	50.2	6.3	+ 1.9
	4	6.5	26.9	52.6	6.6	- 0.1
1977	1	5.3	28.1	55.0	6.9	- 1.6
	2	6.9	29.6	57.7	7.2	- 0.3
	3	9.4	29.8	59.4	7.4	+ 2.0
	4	8.0	30.0	59.8	7.5	+ 0.5
1978	1	5.5				
	2	7.1				

Centring is necessary whenever there is an even number in the moving average. The seasonal variation is calculated in the same manner as the cyclical variation.

Year	Quarters			
	1	2	3	4
1975	-	-	+ 2.1	+ 0.7
1976	- 2.4	-.0.5	+ 1.9	- 0.1
1977	- 1.6	- 0.3	+ 2.0	+ 0.5
1978	-	-	-	-
Totals	- 4.0	- 0.8	+ 6.0	+ 1.1
Divided by	2	2	3	3
Seasonal Variation =	- 2.0	- 0.4	+ 2.0	+ 0.4

Table 1 - Value of variables during the period 1968-1980

Year	Number of cars	Population in 000	Households in 000	Gross National Product in Millions of Dinars
1	2	3	4	5
1968	253.344	19.644	5.169	177.511
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1980	1,863.155	21.974	5.783	347.709

EXERCISE:

1) Using figures from table 1, estimate parameters of the linear trend

$$Y = a + b \times$$

describing the demand for passenger cars in country -A in the given period.

2) Applying the linear trend estimate the demand for passenger cars for 1985.

Table

Value of total material inputs			Probability
A. For sales value:	50,000	(prob. = 0.3)	
10,000 + 50,000 x 1.0 =	60,000		0.2 x 0.6 = 0.12
10,000 + 50,000 x 1.3 =	75,000		0.2 x 0.4 = 0.08
12,000 + 50,000 x 1.0 =	62,000		0.5 x 0.6 = 0.30
12,000 + 50,000 x 1.3 =	77,000		0.5 x 0.4 = 0.20
15,000 + 50,000 x 1.0 =	65,000		0.3 x 0.6 = 0.18
15,000 + 50,000 x 1.3 =	80,000		0.3 x 0.4 = 0.12
		Total	1.00
B. For sales volume :	60,000	(prob. = 0.2)	
10,000 + 60,000 x 1.0 =	70,000		0.2 x 0.6 = 0.12
10,000 + 60,000 x 1.3 =	88,000		0.2 x 0.4 = 0.08
12,000 + 60,000 x 1.0 =	72,000		0.5 x 0.6 = 0.30
12,000 + 60,000 x 1.3 =	90,000		0.5 x 0.4 = 0.20
15,000 + 60,000 x 1.0 =	75,000		0.3 x 0.6 = 0.18
15,000 + 60,000 x 1.3 =	93,000		0.3 x 0.4 = 0.12
		Total	1.00

Table

Sales volume	Prob.	Price	Prob.	Sales value	Prob.
50,000	0.8	1.6	0.4	80,000	0.32
50,000	0.8	1.9	0.6	95,000	0.48
60,000	0.2	1.6	0.4	96,000	0.08
60,000	0.2	1.9	0.6	114,000	0.12

Sales value	Sales revenue	Prob.	Value of material inputs	Prob.	VA	Prob.	Expected VA
					3-5	2x5	6x7
1	2	3	4	5	6	7	8
50,000	80,000	0.12	60,000	0.12	20,000	0.048	960
			75,000	0.08	5,000	0.032	160
			62,000	0.30	18,000	0.036	1728
			77,000	0.20	3,000	0.024	192
			65,000	0.18	15,000	0.054	864
			80,000	0.12	---	0.048	---
53,000	91,000	0.12	60,000	0.12	31,000	0.048	2016
			75,000	0.08	16,000	0.032	768
			62,000	0.30	29,000	0.120	4752
			77,000	0.20	14,000	0.080	1288
			65,000	0.18	26,000	0.108	3150
			80,000	0.12	11,000	0.048	576
60,000	96,000	0.08	70,000	0.12	26,000	0.010	249
			88,000	0.08	8,000	0.006	51
			72,000	0.30	24,000	0.024	576
			90,000	0.20	6,000	0.016	96
			75,000	0.18	21,000	0.014	302
			93,000	0.12	3,000	0.010	29
60,000	111,000	0.12	70,000	0.12	41,000	0.014	634
			88,000	0.08	23,000	0.010	250
			72,000	0.30	41,000	0.036	1512
			90,000	0.20	21,000	0.024	576
			75,000	0.18	38,000	0.032	812
			93,000	0.12	21,000	0.014	302
Σ	---	1.00	---	---	---	1.000	14600

UNIDO TRAINING WORKSHOP SEMINAR

IN INDUSTRIAL PROJECT

PREPARATION, EVALUATION AND FINANCING

Wojciech HUSNER

ECONOMIC EVALUATION OF INVESTMENT PROJECTS

April 16 - May 4, 1984

HAVANA, CUBA

ECONOMIC EVALUATION OF INVESTMENT PROJECTS

(Outline of Courses)

I. Introduction to Economic Evaluation

1. The profitability of an investment can be appraised from the different points of view. One is that of the individual investor for whom the project choice is a comparatively simple and well-defined exercise. There are, however, economic problems which are not perceived by individual investors, as the national economy is not a simple total of individual enrepreneurs. Any investment project has to be evaluated in terms of costs and benefits it generates for the whole society.

2. Commercial profitability analysis, when more deeply scrutinized, reveals numerous shortcomings, foremost among them are:

   a) Commercial profitability evaluation depends on market parameters (prices, wage rates, foreign exchange rates, interest rates, etc), which are almost always distorted and do not reflect national and social priorities.

   b) Any investment project may have influences that work outside the market rather than through it (e.g. air or water pllution), which are called "externalities". They do not enter calculations of commercial profitability however they are obviously relevant for social choice.

   c) Commercial profitability analysis does not take into account various social and political factors (economic self-reliance, military priorities), which are crucial for successful development of the country.

3. Therefore, there is a need for different analytical framework for project evaluation considered from a national point of view. The commercial profitability analysis is not suitable for this purpose.

4. It is an accepted principle that plan requires projects and projects require a plan. This means simply, that a proper economic evaluation of a project cannot be done without central national plan, where basic objectives are formulated and available services identified.

5. The elaboration of a national plan is not an easy task, and among main obstacles are:

   a) High degree of complexity arises from covering all sectors of the national economy,

   b) There is a need to include social factors.

   In spite of all difficulties, national plans must be elaborated and formulated, particularly in countries whose economies are in the early stages of development.

6. The national plan assists economic evaluation of projects in the following ways:

   a) It establishes social and national objectives to be pursued by the economy.

   b) The plan assembles data on the available resources.

   c) The plan makes possible the calculation of national parameters.

   d) The plan gives a dynamic picture of the economy as a whole.

7. So far, no perfect planning system has been formulated, and therefore actual central planning in many cases is supported by market mechanism in performing its functions.

II. Economic Planning - Basic Concepts

8. There are four main elements required for national economic evaluation.

   a) Objectives

   b) Resources

   c) Parameters

   d) Criteria of Selection.

9. Objectives are established within the framework of long-term development strategy in the country. They are next conveyed to central economic plans and formulated into a more specific economic language. While specifying the planning goals, three important problems have to be solved:

a) Identification of national objectives
b) Ranking of objectives
c) Measurement of objectives

10. There is no possibility to establish one aggregate objective for a country. In every country the government formulates a set of objectives which are ranked according to priorities. In line with these priorities different criteria should be established in order to measure the project's contribution. One can distinguish basic criteria and additional criteria corresponding to basic and additional objectives respectively, as ranked in the national plan.

11. One of the most often used criterion is that of the standard of living or the level of development as indicated by National Income (NMP, GNP). It has some shortcomings, but anyway can serve as the important basic criterion.

12. GNP is a macro-level economic term; when translated to the level of project it becomes the value added - the difference between the project's output value and the material inputs value.

13. Goals cannot be achieved without resources, which can be classified as follows: human resources, capital resources and national resources.

14. All parameters being used in economic planning and evaluation can be divided into three groups: technological coefficients prices (in the broad sense) and financial parameters.

15. All prices play twofold role in the economy. On one hand they inform about the relative abundance and scarcity of particular goods, services or factors of production. On the other hand they affect the level of real income, having therefore a distribution impact.

16. Objective function is a specific function to be maximized or minimized and it reflects the level (degree) of achievement of predetermined objectives.

17. All elements discussed earlier have different meaning when applied at the project level by individual investors, and when applied at national level by the central economic evaluator. Therefore, national economic and social evaluation of project requires:

a) A suitable theorethical concept.
b) An institutional framework to carry out national planning and project evaluation.

18. The specific way of introducing particular projects to national plans depends on the planning method in use. There are two comparatively sophisticated practical central planning methods now being used in many countries:

a) Balancing method.
b) Input-Output method.

19. The general rationale behind the balancing method is that it ensures consistence and coordination between supply and demand. The core of the method consists of four types of balances - material balances, resources balances, foreign trade balances and integrated balances.

20. The more comprehensive method of planning is based on the familiar input - output technique. The core of the method is the preparation of a matrix of flows in terms of physical units and in terms of value units from and to the different sectors of economy.

21. Realistic planning is an iterative process, a kind of dialogue between central economic authorities and particular enterprises, with information, suggestions and guidance flowing in an up-and-down form, and not just "from top down" or "from the bottom up".

22. Central planning system assumes different kinds of plans being formulated within the economy. Plans can be classified according to different criteria, e.g. we distinguish:

a) Central plan, sectoral/regional plans and enterprise/local plans.

b) Long, medium and short-term plans.

c) Direct and indirect plans.

III. National economic evaluation

Part I - Theory

23. Project selection, however can be discussed as a separate subject, cannot be evaluated in a disjointed manner without close reference to the overall economic strategic plan of the country. Every investment project should be viewed as part of the broad effort to advance the economy and improve the welfare of the people.

24. A project is a complex of economic activities in which we commit scarce resources in expectation of benefits that exceed these resources. It is important to distinguish between projects, that produce goods and services that can be quantifiable and valued, and those that can not.

25. It is well known that the only source for satisfying and increasing both consumption and investment in the long run is the National Income (NMP,MIP) of the country. Since it corresponds to value added in the project level, the measurement of the

project's contribution to the National Income is an assessment of the value added expected to be generated by investment project.

26. The gross value added is defined as the difference between the value of output and the value of current material inputs. If we next deduct from this the investment cost, we arrive at net domestic value added, which again can be sub-divided into two major components - salaries and wages and the so-called social surplus.

27. The estimation of net national value added (defined as a difference between net domestic V.A and repatriated payments) for any investment project involves application of three independent procedures:

a) Evaluation of direct and indirect effects.
b) Screening and ranking tests.
c) Evaluation under certainty and un-certainty.

28. Direct effects are easy to quantify - they are related directly to the measurable outputs and inputs. Yet indirect effects are other costs and benefits caused by the project under evaluation, occuring however, in other related projects. A very important type of indirect effect is caused by multiplier mechanisms in the field of consumption, investment and savings.

29. Screening tests aims to differenciate between efficient and non-efficient projects from the point of view of the basic criterion (V.A). The valuing tests is run for ranking purposes, if and when more than one project pass screening test.

30. Analysis under certainty assumes certain magnitudes of variables and parameters, which actually are random variables. Un-certainty analysis lifts this assumption, allowing for different values of variables and parameters.

31. All effects caused by project should be valued at their relevant prices. Since these prices differ in most cases from market prices, then a shadow-pricing concept should be used. Shadow price was originally a purely mathematical concept, which, if translated into the language of economic planning, can be understood as marginal increment of the objective function (e.g. GNP), due to a marginal change of the plan's constraints. (e.g. manpower). In practice one can only estimate shadow prices more or less accurately - these estimates are called accounting prices (or adjusted prices).

32. Accounting (adjusted) prices may be calculated for main outputs and inputs. Such accounting prices are then called national income ers. The most essential national parameters are:

a) Social Rate of Discount (SRD)
b) Adjusted Rate of Foreign Exchange (ARFE)

33. SRD is the discount rate at which society as a whole diminishes the weight assigned to next years benefits and costs as compared with those of the current year. Therefore this is a rate of substitution between current consumption and future consumption.

34. The calculation of SRD is one of the most difficult task for central planner. In general, SRD depends on many economic and social factors, like: GNP level per capita, supply and demand for capital interest rates prevailing on money markets, inflation rates, development strategy, etc.

35. The prevailing market interest rate (on capital markets most relevant for the country) can be the convenient reference level (starting point) for establishing SRD. Then the overall financial position of the country should be taken into consideration

a) when the country is a net capital lender

$$SRD = r_m - (P_1 \times r_m)$$

where r_m stands for market rate, &

P_1 for premium multiplier.

b) when the country is a net borrower of funds

$$SRD = r_m + (P_2 \times r_m)$$

36. It is important that a nation-wide uniform SRD is established to make all projects being evaluated fully comparable, there are, however, situations when a modification of SRD is necessary:

a) strategic industries
b) backward regions

The general formula for both cases will be:

$$SRD_I = SRD - (P_I \times SRD)$$

where SRD_I is a special promotional SRD for a given industry or region

37. ARER is believed to reflect more precisely the true value of the foreign exchange to the society. There is a common view that the official rate usually under-values the foreign exchange for various reasons. Therefore, to obtain a realistic picture of foreign exchange inputs and outputs, the calculation of ARER is necessary.

38. ARER can be estimated on the basis of country's current account balance

$$ARER = OER \left(1 + \frac{M-E}{E}\right) = OER \left(\frac{N}{E}\right)$$

where OER = official exchange rate

M = value of imports of goods and services or value of current foreign exchange expenditures;

E = value of exports of goods and services or value of current foreign exchange revenues.

... Social pricing in most cases should be based on the theoretical concept of opportunity cost.

IV. ... Evaluation

Part II - Application

... If all inputs and outputs are properly estimated, the expected value added of the investment project can be calculated. The general formula is:

$$NDV_a = X - (MI + I)$$

where: NDV_a = net domestic value added
X = value of output
MI = value of current material inputs
I = value of total investment

The above statistic formula can be transformed into a dynamic one, covering the whole period of the economic life of the project.

$$\sum_{t=0}^{n} NNVA_t = \sum_{t=0}^{n} X_t - \sum_{t=0}^{n} (MI + I + R)_t$$

Where: R = repatriated payments

NNVA = net national VA

41. The absolute efficiency test (AET) purpose is to show whether the project's VA covers the expected wage bill and provide some social surplus.

a) For a single operating year:

$$E_s = Xt - (MI_t + D) \geq W_t$$

Where: E_s = AET static indicator for year "t";

W_t = total wage bill in the year "t"

b) During project's life time (discounting formula)

$$\sum_{t=0}^{n} (VA)_t \cdot a_t \geq \sum_{t=0}^{n} W_t \cdot a_t$$

42. Project ranking can be accomplished in several different ways, depending on specific economic condition of the country. First, projects can be ranked according to their absolute VA's generated throughout the life period of the project and discounted. The general rule of the VA maximisation should be followed.

Next, some relative efficiency tests (RET) can be run with the help of the following formulaes:

$$E_c = \frac{P(VA)}{P(I)}, \quad E_F = \frac{P(VA)}{P(FE)}, \quad E_L = \frac{(P(VA)}{P(L_S)}$$

Where: (P(VA) = present value added

P(I) = present value of the investment

P (FE) = present value of the net foreign exchange cost

P(L_S) = present value of all wages paid to skilled employees.

43. The basic criterion of VA, although fundamental and comprehensive, does not reflect all possible national objectives and, therefore, has to be accompanied by additional indices, like:

a) Employment effect
b) Distribution effect
c) Net Foreign Exchange Effect
d) International Competitiveness

Relevant formula should be used to calculate all these additional indices.

44. Economic evaluation of investment project should always take into account some supplementary considerations about project implications for the national economy e.g. infrastructural implications, technology transfer implications, environmental implication, etc.

45. There are several causes of uncertainty affecting the elements of economic analysis. The most important are:

a) Price movements and especially inflation increasing prices of inputs and outputs.

b) Changes in technology, affecting the cost structure and relative prices.

c) Changes in demand structure, due to new development in the field of taste related industries, etc.

d) Social and political events.

All these causes have their impact on particular elements of financial analysis, and especially on:

a) Sales revenue
b) Investment cost
c) Production cost
d) Implementation schedule

46. Uncertainty analysis can be undertaken in three steps: break-even analysis, sensitivity analysis and probability analysis. All these techniques are usually applied during financial evaluation of project. Their use within economic evaluation framework differs only in values of parameters taken into calculations.

49. Uncertainty analysis require more elaborate computation as compared with the deterministic case, is more costly and time consuming. Therefore, the additional effort required for it has to be justified by the additional benefits of introducing it.

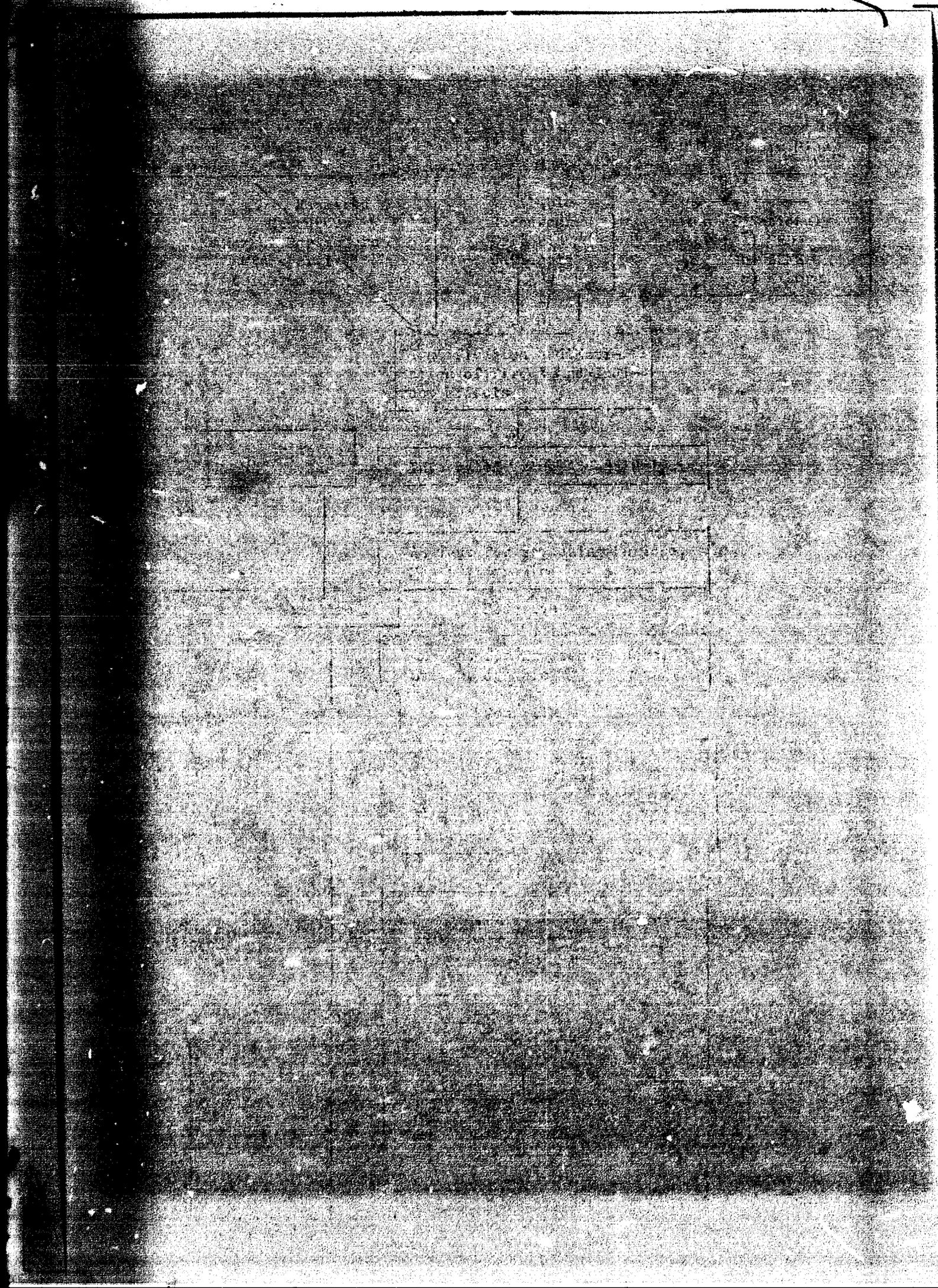
50. When all necessary criteria and indices have been applied, the project evaluator gets a fairly comprehensive picture of the project's contribution to the principal national objectives. The economic evaluation, however, would be incomplete if possible alternatives to the project had not been considered. Even if the evaluation of the project shows its soundness and viability from the national point of view, it is always necessary to compare it with other alternative ventures leading to the fulfilment of the same national objectives.

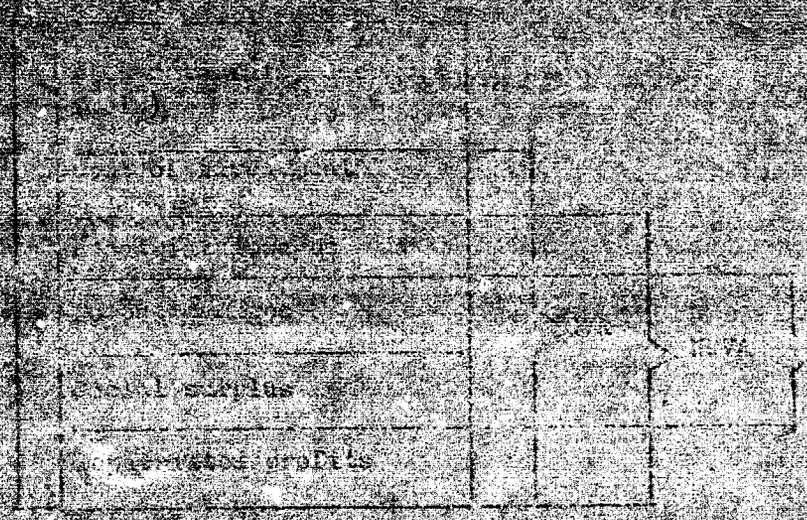
49. In general, the demand for a good or service can be covered by:

a) Domestic production
b) Imports
c) Mixed solution (partly domestically produced and partly imported).

Domestic production requires large investment outlays first to get output later on. Imports means that investment funds can be used otherwise but more negative balance of payments consequences have to be envisaged. Final decision has to be taken after thorough investigation of all possible effects of all conceivable alternatives.

50. The comparison with alternative solutions is made in practice through a "trial-and-error" approach, since sophisticated optimization methods are not available currently to select the optimal solution among all theoretically conceivable projects.





B. HUBSER

Value added - Probability analysis

EXERCISE

The central planner evaluates the soundness of an investment project and decides to allow for different values of:

- total investment cost
- value of current material inputs
- selling price
- sales volume
- economic life of the project

Possible alternative values for all the variables and probability values assigned to them are shown in Table 1.

TABLE 1

ITEMS		Possible values	Probability
1. Investment (in p_s)	A	10, 000	0.2
	B	12, 000	0.5
	C	15, 000	0.3
2. Current material inputs per unit (in p_s)	A	1.0	0.6
	B	1.3	0.4
3. Selling price (in p_s)	A	1.6	0.4
	B	1.9	0.6
4. Sales volume (in units)	A	50, 000	0.8
	B	60, 000	0.2
5. Economic life (in years)	A	15	0.5
	B	18	0.3
	C	20	0.2

What is the expected value added generated by the project?

Table

Value of total material inputs			Probability
A. For sales volume:	50,000	(prob. = 0.8)	
10,000 + 50,000 x 1.0 =	60,000		0.2 x 0.6 = 0.12
10,000 + 50,000 x 1.3 =	75,000		0.2 x 0.4 = 0.08
12,000 + 50,000 x 1.0 =	62,000		0.5 x 0.6 = 0.30
12,000 + 50,000 x 1.3 =	77,000		0.5 x 0.4 = 0.20
15,000 + 50,000 x 1.0 =	65,000		0.3 x 0.6 = 0.18
15,000 + 50,000 x 1.3 =	80,000		0.3 x 0.4 = 0.12
		Total	1.00
B. For sales volume :	60,000	(prob. = 0.2)	
10,000 + 60,000 x 1.0 =	70,000		0.2 x 0.6 = 0.12
10,000 + 60,000 x 1.3 =	88,000		0.2 x 0.4 = 0.08
12,000 + 60,000 x 1.0 =	72,000		0.5 x 0.6 = 0.30
12,000 + 60,000 x 1.3 =	90,000		0.5 x 0.4 = 0.20
15,000 + 60,000 x 1.0 =	75,000		0.3 x 0.6 = 0.18
15,000 + 60,000 x 1.3 =	93,000		0.3 x 0.4 = 0.12
		Total	1.00

Table

Sales volume	Prob.	Price	Prob.	Sales volume	Prob.
50,000	0.8	1.6	0.4	80,000	0.32
50,000	0.8	1.9	0.6	95,000	0.48
60,000	0.2	1.6	0.4	96,000	0.08
60,000	0.2	1.9	0.6	114,000	0.12

Table

Sales volume	Sales revenue	Prob.	Value of material inputs	Prob.	VA	Prob.	Expected VA
					[illegible]	[illegible]	[illegible]
1	2	3	4	5	6	7	8
50,000	75,000	0.32	60,000	0.12	15,000	0.038	768
			65,000	0.04	10,000	0.026	128
			62,000	0.30	13,000	0.096	1728
			77,000	0.20	3,000	0.064	192
			65,000	0.18	15,000	0.058	864
			60,000	0.12	——	0.038	——
50,000	75,000	0.48	60,000	0.12	15,000	0.072	2016
			75,000	0.08	20,000	0.038	768
			62,000	0.30	13,000	0.144	4752
			77,000	0.20	13,000	0.096	1248
			65,000	0.18	25,000	0.086	2160
			60,000	0.12	10,000	0.058	576
50,000	75,000	0.08	70,000	0.12	25,000	0.010	240
			83,000	0.04	8,000	0.006	51
			78,000	0.30	21,000	0.024	576
			80,000	0.20	5,000	0.016	96
			75,000	0.18	21,000	0.014	302
			81,000	0.12	3,000	0.010	29
50,000	75,000	0.12	70,000	0.12	25,000	0.014	624
			83,000	0.04	26,000	0.010	250
			72,000	0.30	13,000	0.036	1512
			80,000	0.20	25,000	0.024	576
			75,000	0.18	33,000	0.032	842
			93,000	0.12	21,000	0.014	302
Σ	——	1.00	——	——	——	1.000	11880

W. HUBNER

SHADOW PRICING EXERCISE

Information

1) Production enterprise "La Habana" in the given period "t" has at its disposal 1 000 units of labour (L), and 600 units of production capital (machinery, technical equipment, etc.) (C).

2) Using these resources the enterprise may produce 2 products X_1 (measured in tons) and X_2 (measued in meters)

3) The following vectors describe the interrelation between resources and outputs:

$$\mathbf{L} = [\lambda_1 \quad \lambda_2] = [4 \ , \ 2] \text{ u.l./t, u.l./m}$$

$$\mathbf{C} = [\bar{c}_1 \quad \bar{c}_2] = [3 \ , \ 1] \text{ u.c/t u.c/m}$$

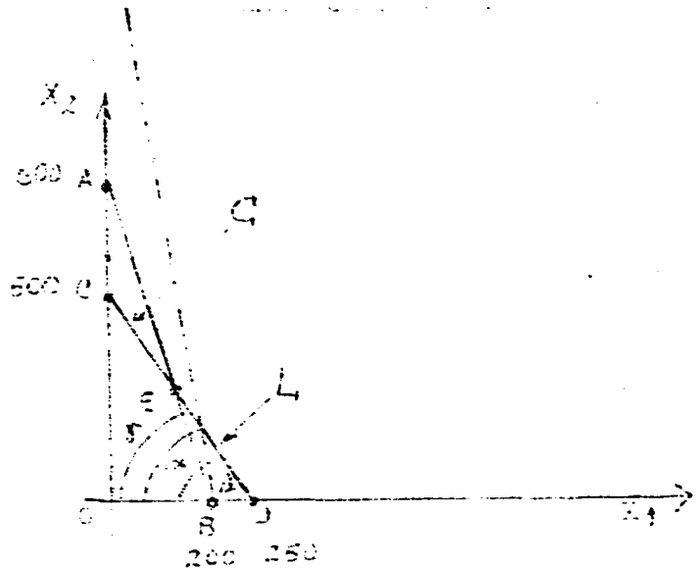
4) Prices are given:

$$P_1 = 40p_s/t \qquad P_2 = 10p_s/m$$

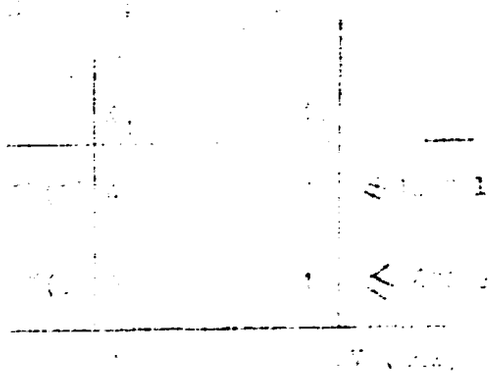
Problem:

1) Find the optimal structure of production of X_1 and X_2 from the point of view of maximization of its value.

2) Compute the shadow prices for both labour and capital. What is their interpretation?



$$\operatorname{tg}\alpha > -\gamma > \operatorname{tg}\beta$$



$4X_1 + 3X_2 \leq 1\,000$ l

$3X_1 + X_2 \leq 600$ c

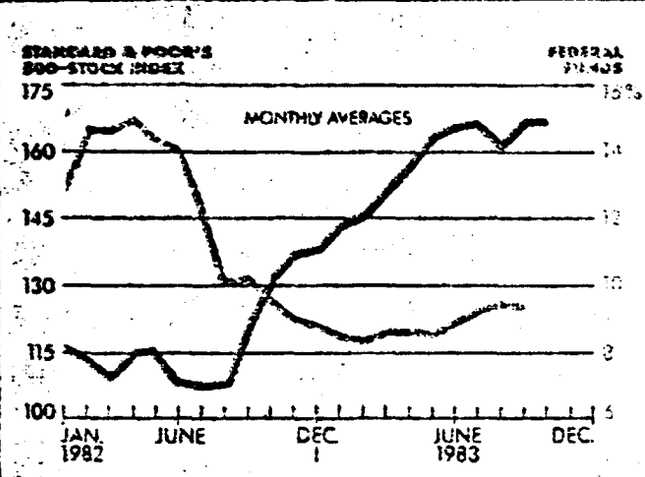
$40X_1 + 10X_2 = V_{max}$

[illegible]

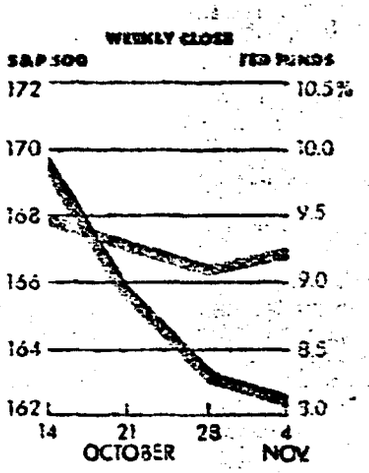
[illegible] $\geq$ [illegible]

[illegible] $\geq$ [illegible]

Financial Figures of the Week

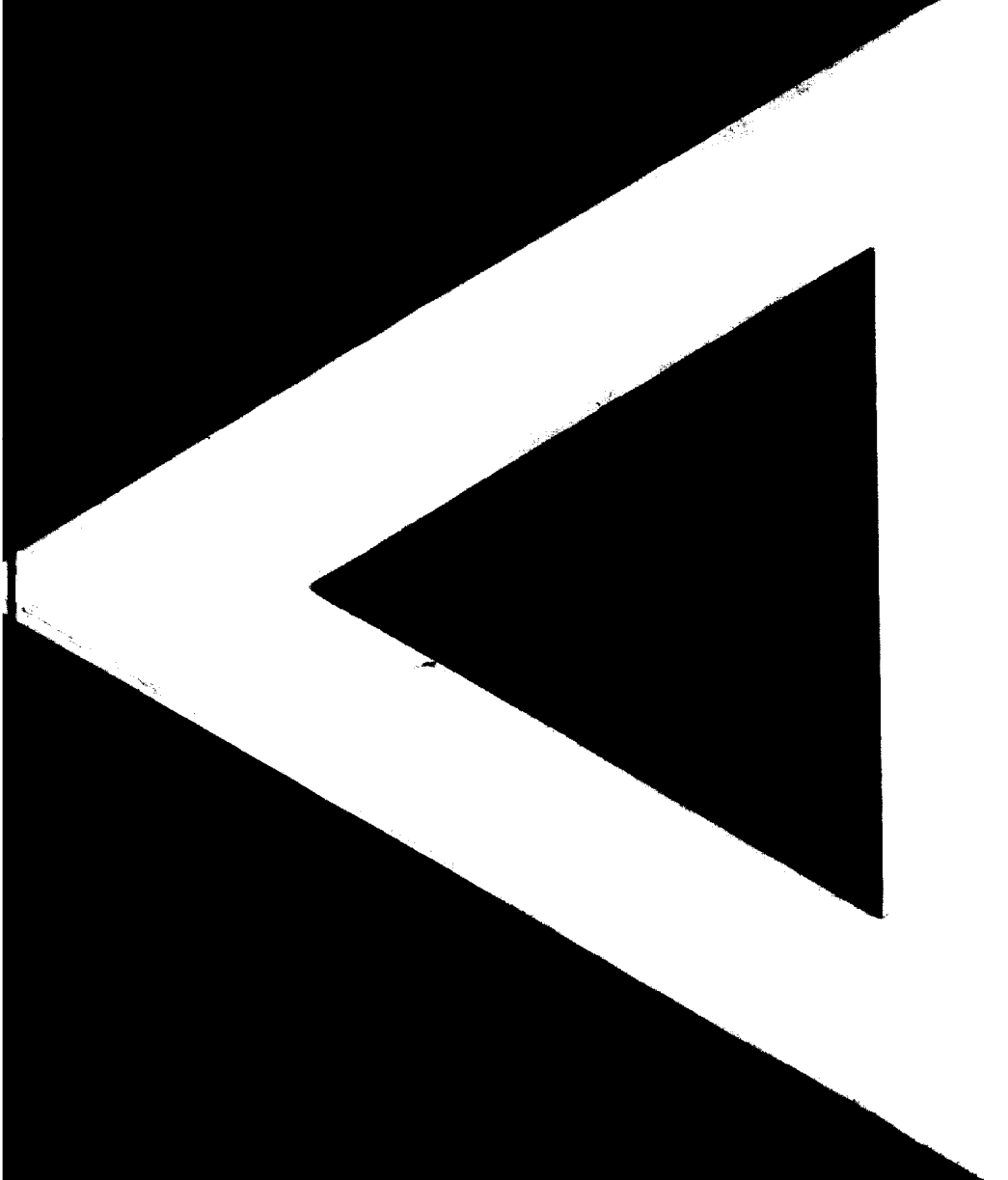


Despite some slippage in the federal funds rate, stock and bond prices failed to gain much ground. Several rally attempts in stocks have faltered, in part due to the intensifying tax-loss selling as the yearend approaches. Also damping investor enthusiasm is the continued concern over short-term interest rates, the apparent stalemate over the budget deficit, and the heightened Mideast tension.



	Latest week	Week ago	Month ago	Year ago	1973 average
MONEY MARKETS					
Federal funds	9.25%	9.45%	9.56%	9.31%	8.73%
Prime rate	11.00%	11.00%	11.00%	12.00%	8.03%
Commercial paper, 3-month*	9.10%	8.95%	8.88%	8.50%	8.11%
New Treasury bills, 3-month	8.81%	8.48%	8.86%	8.02%	7.04%
New Treasury bills, 6-month	9.03%	8.72%	9.02%	8.34%	7.18%
Eurodollar rate, 3-month**	9.63%	9.56%	9.46%	9.81%	9.20%
Certificates of deposit, 3-month	9.43%	9.30%	9.23%	9.65%	8.21%
Euromarket CDs, 3-month	9.65%	9.51%	9.45%	9.25%	NA
Singapore CDs, 3-month	9.77%	9.64%	9.55%	9.35%	NA
MONETARY INDICATORS					
Money supply (M1), seas. adj., in billions***	$518.3	$517.4r	$518.4r	$470.9r	$259.1
Banks' business loans, in billions***	215.0	215.4r	213.4r	216.9r	96.9
Free reserves, in millions**	-20	21r	-59r	353r	-1393
Commercial paper, nonfinancial, in billions***	45.5	47.0r	46.2r	54.9r	6.97
STOCKS					
Standard & Poor's 500-stock index	161.76	163.84	170.34	143.02	107.43
Price-earnings ratio (S&P 500)	12.83	13.00	13.51	10.04	7.12
Dividend yield (S&P 500)	4.25%	4.36%	4.17%	4.78%	3.06%
Dow Jones industrial average	1214.34	1229.27	1285.14	1060.25	923.86
Lipper growth mutual fund index	213.14	215.39	228.15	180.25	81.16c
Average daily NYSE volume (millions of shares)	77.4	80.9	94.0	113.87	16.1
Average daily NYSE blocks (10,000-plus shares)	1344	1404	1750	1800	116
BONDS					
New Aaa utilities*	12.88%	12.75%	12.13%	11.75%	7.87%
New Aa industrials*	12.88%	12.63%	12.13%	11.38%	7.52%
U.S. governments (8 1/2%s of 1994-99)	11.80%	11.65%	11.52%	10.17%	7.11%
Bond Buyer 20 municipals	9.79%	9.81%	9.49%	9.86%	5.22%

FOREIGN EXCHANGE	Prime rates	Units per U.S. dollar: Latest week	Week ago	Month ago	Year ago	1973 average
German mark	6.00%	2.67	2.65	2.57	2.45	2.67
Swiss franc	5.50%	2.17	2.15	2.09	2.08	3.17
Japanese yen	5.75%	236	235	230	243	272
British pound (in U.S. dollars per pound)	9.00%	1.48	1.48	1.50	1.82	2.45
Canadian dollar	11.00%	1.24	1.23	1.23	1.24	1.00
French franc	12.25%	8.13	8.07	7.90	6.92	4.46
Mexican peso	n	160	160	154	114	12.50

*All figures are as of Tuesday, Nov. 8 (unless affected by Election Day market closings), except those marked *, which are from Friday, Nov. 4, those marked **, which are from Wednesday, Nov. 2, those marked ***, which are from Wednesday, Oct. 26, and the Bond Buyer index from Thursday, Nov. 3. r=revised NA=not available c=close n=composite*

Data: Federal Reserve Bank of New York, First Boston Corp., Irving Trust Co., Lipper Analytical Distributors Inc., Salomon Bros., Standard & Poor's Compustat Services Inc.