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United Nations
Centre for Industrial Development

Inter-regional Symposium on
Industrial Project Evaluation

CID/IPE/Gen.2

Prague, Czechoslovakia
11 - 29 October, 1965

GENERAL DOCUMENTATION FOR THE
INTER-REGIONAL SYMPOSIUM ON
INDUSTRIAL PROJECT EVALUATION

- A. Preliminary step in setting
up Industrial Projects
- B. Considerations in Evaluation
of Industrial Projects
- C. Follow-up and supervision of
Industrial Projects
- D. Survey of Country Experience
(including Case Studies)
- .. Miscellaneous Documents

A. PRELIMINARY STEP IN SETTING UP INDUSTRIAL PROJECTS

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1.	CID/IPE/A.2	Project Evaluation-Data and Other Information Required for the Purpose	K.C. Mitra
2.	CID/IPE/A.2	Implementation of Industrial Development Programs using Critical Path Network Theory	E.P.C. Fernando
3.	CID/IPE/A.3	Project Evaluation and the Consistency of the Plan	G. Cukor
4.	CID/IPE/A.4	Organizing Professional Cadres for Industrial Project Evaluation, Selection and Follow-up	J.D. Nyhart
5.	CID/IPE/A.5	Beyond Project Evaluation	U.S. Agency for International Development
6.	CID/IPE/A.6	Information required by ICICI Ltd. for Project Appraisal for their Clients	Industrial Credit and Investment Corporation of India, Limited
7.	CID/IPE/A.7	Strategie du Développement Industriel: Programme d'Etudes Generales pour les Pays Associes à la Communauté Economique Européenne	André Lagreets
8.	CID/IPE/A.8	A New Approach to Training Managers for Industrial Development	H.A. Riker, Jr.
9.	CID/IPE/A.9	Essential Elements in the Preparation of Industrial Projects	S.J. Langley
10.	CID/IPE/A.10	Standard Designing in Industrial Construction in the CMEA Member Countries and its Evaluation	Council for Mutual Economic Assistance
11.	CID/IPE/A.11	Project Evaluation and Industrial Development Programming	N.F. Figueiredo
12.	CID/IPE/A.12	Requirement for Data and Other Information for Evaluation of Industrial Projects	Z. Blazej and V. Lorens

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15.	CID/IPE/B.3	Uncertainty in Industrial Project Evaluation with Special Reference to Export Industries	M.V. Pejovic
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17.	CID/IPE/B.5	Requirements of Skilled Personnel for Industrial Projects and their Appraisal	Sanford Cohen
18.	CID/IPE/B.6	A System for Industrial Project Evaluation	M.J. Solomon
19.	CID/IPE/B.7	Managerial Requirements and their Appraisal in Industrial Project Evaluation	W.H. Newman
20.	CID/IPE/B.8	Industrial Project Evaluation and the Engineer	Michael Ching
21.	CID/IPE/B.9	General Criteria for Industrial Project Evaluation	A.K. Sen
22.	CID/IPE/B.10	The Rate of Interest and the Value of Capital with Unlimited Supplies of Labour	S.A. Marglin
23.	CID/IPE/B.11	Inter-industrial aspects of Project Evaluation	Zoltan Roman
24.	CID/IPE/B.12	Some Considerations on the Relationship between the Industrial Projects and Transport Services	Gabriel Siri
25.	CID/IPE/B.13/ Rev. 1	Capital Budgeting and Pricing Techniques	J.R. Meyer and L.M. Cole
26.	CID/IPE/B.14	Criteria of Economic Intergration in the Industrial Project Evaluation in Developing Countries	V. Cerniansky
27.	CID/IPE/B.15	A Study of Environmental Considerations in Industrial Project Evaluation with Special Reference to the Productivity of Labour	V. Halasz

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31	CID/IPE/B.19	Survey of Literature on Cost-Benefit Analysis for Industrial Project Evaluation	A.C. Harberger
32	CID/IPE/B.20	Useful Procedures suggested for Developing Countries by the Discounted Cash Flow Technique	John McArthur
33	CID/IPE/B.21	Study of Industrial Plant Systems	ELC - Electroconsult Milano, Italy
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35	CID/IPE/B.23	Problems and Methods of Research into the Effectiveness of Investments in Poland	M. Rakowski
36	CID/IPE/B.24	The Economic Evaluation of Productive Invest- ments in Hungary	M. Turansky
37	CID/IPE/B.25	Bibliography on Project Evaluation	P.E. Cookson and J.L. Tyron
38	CID/IPE/B.26	Evaluation of Industrial Infrastructure Methodology and Practical Experience	T.E. Kuhn
39	CID/IPE/B.27	Foreign Trade Criteria in Industrial Project Evaluation	R. Schmals
40	CID/IPE/B.28	Project Evaluation in the Presence of Economies of Scale and Indivisibilities	T. Victorias
41	CID/IPE/B.29	Shadow Prices in Industrial Project Evaluation	J.S. Fleming and M.S. Feldstein
42	CID/IPE/B.30	Pricing Problems in Industrial Project Evaluation	M. Ostrowski and Z. Sadowski

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45.	CID/IPE/B.33	National and Commercial Profitability	C.M. Foster
46.	CID/IPE/B.34	Criteria for Evaluation of Industrial Projects in an Open Economy	L. Csapo and M. Mandal
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50.	CID/IPE/B.38	Evaluation of an Industrial Project from the Point of View of a Rational Location of Productive Forces	E.B. Alaev
51.	CID/IPE/B.39	Methods of Technical and Economic Foundation of the Development of Industrial Centres	E.B. Alaev
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53.	CID/IPE/B.41	Skill Formation in Japan	M. Yamada and M. Yokomizo
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57.	CID/IPE/B.45	Combined Criterion for Investment in Manufacturing Industries in Developing Countries	Research Division Centre for Indus Development, United Nations
58.	CID/IPE/B.46	The Optimal Selection of Export-promoting and Import-substituting Projects	M. Bruno

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65.	CID/IPE/D.4	Planificacion Global Y Evaluacion de Proyectos	M.A. Figueron
66.	CID/IPE/D.5	Criteria for and Experience in Project Evaluation	M. Reza Amin
67.	CID/IPE/D.6	Influence of Local Conditions in Project Evaluation	A. El Barbary
68.	CID/IPE/D.7	Selected Harvard Business School Case Studies: Nos. F985, 986, 987, 988, 989, 990, 991; ICR261 (and questionnaire).	Harvard Business School
69.	CID/IPE/D.8	Foundry Forge Project	S.D. Joshi
70.	CID/IPE/D.9	Governmental Assistance in Establishing Industrial Projects in the Private Sector	Pakistan Indust. Credit and Inve: Ltd.
71.	CID/IPE/D.10	Project Appraisal in PICIC	S.V. Durrani
72.	CID/IPE/D.11	Selected Methodological Problems of Economic Efficiency in Capital Investment in Bulgaria	Ivan Ivanov
73.	CID/IPE/D.12	System of Appraisal of Industrial Projects in Yugoslavia	M.V. Pejovic
74.	CID/IPE/D.12 (Annex)	Application for Credit for a Cement Factory	M.V. Pejovic
75.	CID/IPE/D.13	Experience in Industrial Project Evaluation in Nigeria	G.A. Fatoye
76.	CID/IPE/D.14	Colombia's Experience in Industrial Project Evaluation	I. Parra-Pefia

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80.	CID/IPE/D.16	Appraising an Industrial Project in India	The Industrial Credit and Investment Corporation of India Ltd.
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83.	CID/IPE/D.19	Project Evaluation and Development Planning	Seyfettin Behzat Akgur
84.	CID/IPE/D.20	The Growth of the Internal Market in Relation to the Strategy of Economic Development	Romulo Arena
85	CID/IPE/D.21	A Case Study of the Textile Fabrics Corporation	Stanford University
(CID/IPE/D.22	Operational Planning of a Sponge Iron and Continuous Rolled Steel Production Process	H. A. Havemann
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88	CID/IPE/D.24	Estudio de Factibilidad Planta Para Fabricacion de Peroxido de Hidrogeno (Agua Oxigenada)	A. B. Gonzales
89.	CID/IPE/D.25	Evaluation of Projects in Bolivia	Lic. C. Alipaz Alcazar
90.	CID/IPE/D.26	Projects for Industrial Development in Iraq	B. Al-Dabouni
91.	CID/IPE/D.27	A Men's Hosiery Manufacturing Facility for Nigeria	Arthur D. Little Inc. Massachusetts U.S.A.
92.	CID/IPE/D.28	Feasibility of a Cassava Starch Industry in Nigeria	Arthur D. Little Inc. Massachusetts U.S.A.

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97.	CID/IPE/D.33	Feasibility of Fixed Nitrogen Facility in the Philippines	Arthur D. Little Inc. Massachusetts U.S.A.
98.	CID/IPE/D.34	Evaluation of Industrial Projects - Case Study on Power Industries	E.A. Elohin
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100.	CID/IPE/D.36	Evaluation of Industrial Projects in Ceylon	G. Gunatilleke
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102.	CID/IPE/D.38	Israel's Experience in Industrial Project Evaluation*	Israel
103.	CID/IPE/D.39	Experience of the West Pakistan Industrial Development Corporation in Developing the Industrial Potential in Pakistan	A.M.K. Masazi, Chairman
104.	CID/IPE/D.40	Financing of Industrial Projects	Instituto Mobili. Italiano, Italy
105.	CID/IPE/D.41	Summary Analysis of Country Experience in Industrial Project Evaluation	Gordian O. Nwora and Harrison Akpan

* Title is tentative

MISCELLANEOUS DOCUMENTS

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CID/IPE/Misc.1	Summaries of Documents Submitted to the Symposium on Industrial Project Evaluation	Centre for Industrial Development, United Nations
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CID/IPE/D.42	Process and site evaluation for the iron and steel industry in Mexico	Carlos Quintana Gerardo Ruano Fernando Gonzalez Varona
CID/IPE/D.43	Technical and economic industrial project evaluation	Ferenc Tóth Fosta Kostor Stefan Datchev
CID/IPE/D.44	L'importance du cadre institutionnel dans l'évaluation des projets industriels	Toufik Khirish
CID/IPE/D.45	Criteria for evaluation of industrial projects	Industrial Finance Corp. of India
CID/IPE/D.46	Project evaluation of state enterprises in Ghana	T.V. Dada
CID/IPE/D.47	Industrial project evaluation in Czechoslovakia: selected studies	The Research Institute for Building and Architecture

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**METHODOLOGY OF INDUSTRIAL PROJECT
EVALUATION IN CZECHOSLOVAKIA**

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Introduction

The evaluation of industrial projects in the Czechoslovak Socialist Republic has specific features which follow from the substance of planned control of national economy and from the evaluation of effectiveness of the whole socialist reproduction. The industrial projects and the effectiveness of investment at all are considered within the evaluation of the development of the whole national economy both from economic and social aspects.

The extent of satisfaction of present and future needs of the socialist society serves as summary criterion of the effectiveness of investment. The system of methods of industrial project evaluation follows therefore the relations from the broadest economic aspects, relation of branches and regions, up to the individual factory both in project design and in course of operation.

The economic effectiveness of investment depends upon their territorial dislocation, i.e. on the distribution of economic tasks to individual regions and on the proper location stated by the territorial plan. It is therefore necessary to mention briefly at least some basic requirements of the planned development of national economy and the main tasks of town and country planning (designing).

The distribution of industry within the planned central
of national economy

The distribution of the productive forces follows the requirements of a planned proportional development of national economy aiming at a purposeful distribution of industrial production on the state territory. We are seeking here the optimum location of industry as near as possible to the sources of raw materials, eventually to the areas of consumption with full utilisation of local resources in order to promote - when assuring the complex development of national economy - the maximum development of individual regions according to their own conditions, contributing to the economic and cultural rise of underdeveloped regions. Modern notions of scientific, rational production management are respected, the advantages of specialisation, concentration and combination of production are being exploited and such branches or sectors chosen, which complete each other as far as the use of resources and means of production is concerned. The goal is a reduction of social cost of production and consumption, increase of social labour productivity, liquidation of disparities of economic and social conditions of life between regions, between town and country, and continuous general rise of living standard of the entire population.

The main condition of a realistic and successful planning of national economy is the socialist social ownership of the means of production. It enables us to utilize all ma-

terial and financial resources as well as manpower on a national scale according to a plan to the best advantage of the society. The more effective is the utilization of these resources, the quicker is the development of national economy and the more fully all material and cultural needs of the population can be satisfied.

When solving the ~~problems of the dislocation of production~~ it is necessary to bear in mind that individual industrial branches, sectors, and even individual production aggregates and factories have different requirements to ensure a regular operation or to increase it by means of investment.

The natural and economic conditions of each region influence also the effectiveness of dislocation in a different way. The main tool of an effective dislocation of productive forces is a perfect knowledge of regions which is necessary if the most rational division of labour and other optimum conditions of production in a region are to be ensured.

The planning activity of a socialist State aims in the first place at

- the elaboration of a long term policy of economic development with the view to satisfy the increasing needs of the society to the greatest possible extent;
- a proper distribution of the social product assuring the optimum reproduction in national economy and a proper structure of investment putting that reproduction in effect;

- a proper allocation of productive forces, making use of natural and economic conditions of regions, a gradual levelling of living and cultural standard of population on the whole territory of the state, creation, protection and further improvement of living environment as one of the main prerequisites for a healthy development of the population;
- a proper application of the achievements of science and technique, a direction of research and development and an intensive education for raising the skill of working people as the main means of increasing the social labour productivity.

The most important tasks expressed in long-term perspectives, as well as in prospective and yearly plans are determined in conformity with the mentioned leading and general principles. A long-term perspective sets the directive of economic development for a period of 15-20 and even more years thus making possible a long-term preparation in all branches of national economy. It is a characteristic feature of long-term perspectives to set down first of all the present urgent tasks in order to enable the society to reach in a fixed period the expected level of development, while the quantity of production at the end of this period is not determined definitively by this stage of plan. The main target of a long-term perspective is consequently to direct individual branches and sectors of national economy to take such present measures which allow to reach the fixed targets in a relatively distant fu-

ture. This fact is very important with regard to the investment, which is substantially a long-term process lasting several years in some cases; it is practically a permanent activity within the complex of the whole branches or sectors.

With regard to this role, a long-term perspective sets first of all the proportions and main trends of development. It states for instance that from the whole creation of national product, an average of 22,5% will be allotted for the investment (i.e. for the creation of basic funds) in a period of 20 years. At the same time the speed of investment can be increased - it will be 21% e.g. during the first five-year period and 24% during the last -, it can be also constant or show only insignificant deviations from the average. All this depends from the rest of conditions in individual states. A very important task of a long-term perspective is the setting down of the structure of investment, such as fixing the share of production investment and other investment of social consumption, especially of housing construction and complete construction of towns and villages. In many countries even the share of construction work in the whole volume of investment is being followed as an important index. In our conditions, we consider that a rough balance of building investment and machinery is convenient, i.e. if the share of both of them makes about 50%. This means of course that in production investment, the share of machinee predominate over the construction work. If a long-term perspective plan fixes, e.g. the share of production investment as 48 % from the to-

tal volume of them, then the machinery investment should involve about 65-70 %, i.e. roughly 33 % of the total volume of investment. In the volume of social investment, the share of machinery investment is generally lower - one fifth to one fourth, and in a long-term perspective plan amounts approximately to 15 % of the total volume of the investment. With regard to the development of mechanisation resp. automation of all sectors of our life, the share of machinery investment shows an increasing trend in all sectors of the investment; in our country, we consider this evolution to be correct.

In its further part the long-term perspective plan lays down also the shares of separate branches of national economy and the speed of their respective development. As a basis for fixing the speed of industrial development, we use a confrontation of quantity of social needs with an information on the condition and utilisation of natural resources on the territory of a state (useful minerals, forests, agricultural soil, possibilities of water power utilisation), with data concerning the condition and territorial distribution of existing basic funds, further with the value, quantity and assortment of available industrial and agricultural products, with data on the capacities of contractor branches participating in the investment. We take these capacities into consideration both as a complex and with regard to their territorial distribution. Calculations concerning the development of the composition of population, and the resulting data on

quantitative trends of individual manpower categories, information on the condition of dwellings, community facilities, sanitary and other social equipment serving the satisfaction of the needs of population are considered a very important factor in this sense.

The various stages of elaboration of long-term perspectives and naturally also a prospective and working plans are laid down by the Government, while their more detailed itemisation and ensuring are the task of planning bodies of all levels. The State Planning Board bears the responsibility for a complex solution of problems connected with the planning of national economy. This Board co-ordinates and controls accordingly the activity of departments responsible for individual sectors and of Regional National Committees responsible for the economy within their respective regions.

An important basis for the elaboration of all plan stages of the development of national economy are technical and economical conditions and analyses of the development of material resources, elaborated by individual economic branches for their long-term perspectives (a long-term perspective e.g. of coal mine output in a certain district, of agricultural production in a region and the respective investment needs, of applying progressive production methods as automatization, complex mechanization, industrialization of building etc.)

The prospective plans - in our country usually five-year plans - precise the data stated in a long-term perspective,

and in contrast to it set the tasks for individual branches and sectors already with a considerable degree of liability. It means that a prospective plan determines the quantity and assortment of production to be manufactured within the planned period and the final condition at the end of this period. In relation to the preceding example of data in long-term perspective, the prospective five-year plan lays for instance that the investment will involve 22 % of the whole national product, with a 48 % share of machinery investment, determines that the housing construction e.g. will get 5 % of the national product, i.e. 25 % of the volume of investment, and itemises the data of the prospective plan in more detailed information according to the conditions and needs of the state's economy. While the prospective plan considers the investment besides its basic proportions only in main outlines, and determines specific investment actions in individual branches influencing the proportions and structure of national economy, the five-year plan ensures the investment in details, determines the stages concerning the territorial problems of construction, elaboration of design documentation, beginning of construction, and putting of capacities into operation.

The long-term perspectives are more important for the dislocation of productive forces, as it is possible to solve in their elaboration the long-term problems connected with the construction of large industrial bases, renovation and construction of new branches, industrialisation of backward branches, construction and renovation of housing estates,

towns and villages, transport network. water and sewage network etc.

The five-year plans can rectify the intentions of a long-term perspective only in changes of repartition of the expected construction in time, in a more precise location of individual investment etc.

Territorial distribution (location) of industry - methods of town and country planning (designing)

Industrial and agricultural areas, transport network, town and villages represent complicated economic, cultural and technical entities, large material and cultural values. Reconstruction and new investment must create conditions of further general development of a given formation. At the same time it is necessary to remove incessantly the defects due to the development on a lower level of knowledge, particularly to the elemental development before the second world war. All this requires a comprehensive technical and economic design preparation starting from an analysis of existing relations in a territory and ensuring an optimum solution by means of a synthesis of relations created by the expected construction or reconstruction. And this is precisely the task of town and country planning (designing).

It is necessary to pay considerable attention not only to the dislocation of investment to separate regions but also to the precise choice of building site. The plans of economic

development, especially in long-term perspective, solve first of all questions of dislocating industrial enterprises in relation to problems of economic structure of the respective region, to consumer-contractor relations (relations to sources of raw materials and basic materials, relations to the market) and further economic problems. Nevertheless, it is necessary to follow in every detail the characteristics of the area (building site) of the construction, to find if necessary the optimum site for a given purpose. It is necessary to state expressly and evaluate the consequences of each development program, the further investment which will become necessary especially from the point of view of the conservation of living environment; further the requirements must be fixed which will ensure an organic integration of new construction in the landscape and existing coverage.

Town and country planning is consequently a technical and economical activity of analytic and synthetic character solving the organisation, construction and renovation of larger areas, settlement, of towns and villages, relations between production and dwelling (in a large sense of this word), between production and consumption (including transportation, storage and commerce), between production and landscape etc. To be concise we do not mention the tasks of town and country planning in other relations but those concerning the production. The complex conception of town and country planning involves also the solution of architectural questions and landscaping.

The State plan of economic development is in a certain sense the directing factor and the starting point for town and country planning (designing) which has to propose the allround most convenient solution of the tasks of economic plan in a territory. Nevertheless, territorial plans /designs exercise a feedback influence on the economic development plans especially in relation to the possibilities of the territory, complex character of the construction, its speed and economy. Owing to such a conception of its role, town and country planning is an important factor affecting the planning of economic development especially in the phase of long-term perspective and during the elaboration of perspective plans. Town and country planning affects the elaboration of an economic development plan mainly in the following directions:

- it verifies the convenience of a region /territory for the construction proposed by a long-term perspective or prospective plan of economic development. In this respect, town and country planning can provoke even a change of the plan project, proving that an area is inconvenient for the construction under consideration from technical and economic point of view;
- it fixes more precisely the timely and territorial linking of separate investment programs set down in plans of economic development;
- it proves the inevitability of investment necessitated by the construction which is inevitable to proper function of

the originally-planned investment or for ensuring a standard of living environment in the area under consideration, or for a complex function of all basic funds of the area according to assumptions stated in economic plans and political directives of the Government;

- it proves and fixes more precisely bases for stating complex construction cost with regard to investment necessitated by the construction and, this way, even for a complex evaluation of economic resp. social effectiveness of the planned investment.

The co-ordination of territorial plans with designs of individual constructions allows to ensure the influence of town and country planning bodies on the design of every construction and to avoid separation of designing activity from the requirements and principles of town and country planning. On the other hand, this linking between town and country planning and preparation of individual constructions in plan and design requires the basic tasks of town and country planning to be solved well ahead of starting designing work, especially to work out and approve in time territorial plans for larger areas and estates where the economic plan expects a larger and more concentrated construction or systematic reconstruction. To the extent of its tasks, town and country planning plays the role of factor co-ordinating interest and needs of different branches and sectors of national economy and of diverse social interest on the area under consideration.

Before starting designing work it is necessary to define at first a site for the construction under consideration and to fix conditions with which a construction can be built on a given site with regard to its environment. Location and siting proposals are submitted by designing institutes or investor to the respective town and country planning authority which, after consideration of all public interest, passes the planning and siting decision, stipulating the conditions to be observed by the designer when elaborating the respective design. Town and country planning authorities give their view on the general lines of the proposed solution even in questions which could not be examined before the elaboration of the design.

Industrial Project Designs

The development of economic structure of the Czechoslovak Socialist Republic, which was connected with an immense investment of industrial base, influenced even the individual industrial project designs and the layout of organizations carrying out this important activity. Technical processes in industrial project designing are, in the main, identical with the processes chosen by private design organizations in economic conditions of capitalism, but their economical solution and broader linking of an individual construction to the state economic system and planned formation of working and living standard are subordinated to social interest of a substantially higher intensity.

Within the twenty years of upbuilding of socialism in the Czechoslovak Socialist Republic, the crumbled network of private design offices was changed into a network of design organisations with about 30,000 employees. These organisations elaborate industrial project designs, and their activity, in contrast to regionally organised network of housing, civic and agricultural design organisations, covers the whole territory of the state. This concentration helps to increase the skill and quality of designing and ensures the possibilities of designing for foreign clients.

Individual industrial design institutes are specialised in designing for a determined sector of national economy and have on average 500 - 2,500 employees. Each organisation is completely provided with specialists of all design professions and with sufficient means to solve all tasks from geological survey of the site to technical and economical solution of the buildings and of technological processes, including the estimates and the organization of site processes.

The activity of design institutes links up to a considerable number of designers employed in production enterprises, who /1/ elaborate designing data for institutes from the view-point of constructional and productional conditions of future contractors, and /2/ complete the designs elaborated in specialised institutes by providing them with details necessary to the whole realisations.

The first stage of the design activity and of the respec-

tive research is the so-called investment brief. It serves the investor to define real and specific motives for the construction and its location and to determine reasonable investment cost, technical and economical indices and other data necessary to its smooth running. At the same time it involves also data on the considered technology of future production, data on linking to production capacities and marketing possibilities including data on investment necessitated by the construction. Under the term "investment necessitated by the construction" is to be understood the cost, which other investors must really expend together with the investment in a local and temporal continuity with the designed construction.

A part of the investment brief is formed by the proposal of time schedule of further preparation and realisation of the construction containing terms required for the elaboration of design documentation in linking with the process of realisation and setting of individual capacities into operation.

The document elaborated in this way must be approved by appointed authorities, which consider it particularly from the viewpoint of technical and economical development of the respective branch and sector. These authorities having the competence to approve investment briefs, are discerned by the character and importance of the construction - from production enterprises to ministries. The investment briefs of

particularly important and extensive constructions are approved by the government on appraisal by its specialized bodies.

Each investment brief must be discussed with the bodies and organisations, the interest or competence of which are affected by the designed construction. The stand-point of the National Committee, in whose district the construction is to be built, and which considers the design from several view-points (territory, manpower possibilities, transport network, water sources, energy, influence on the creation of living standard) is of first importance. The investment brief must be discussed also with production organisations, to which it has some continuity, including the claims necessitated by the realisation of the construction, from the view-point of their ensuring with materials and capacities.

The views of the contents, particularities and liability of investment briefs varied in the past years. There were even tendencies to a maximum limitation of the contents and liability of investment briefs in their character of initial documents of the construction, nevertheless however, it became soon evident that such views were quite unprofitable. A responsible elaboration of basic technical and economical conditions of the designed construction into a complex of an obligatorily approved document creates therefore the first condition of economic effectiveness of the investment.

On the basis of the investment brief elaborated, evaluated and approved in such a way, the investor places the elab-

ration of design documentation to a general designer, who is, in case of industrial projects, usually represented by a state design institute of the respective branch or sector. As far as the elaboration of design documentation is concerned, the general designer is responsible to the investor for the

- attainment of maximum economy, including the optimum delay of construction,
- maximum possible technical progressivity of the designed construction,
- integrity of the design documentation,
- mutual co-ordination of all its parts,
- complex elaboration of individual stages of documentation in due time.

Besides simple constructions with a known technology or a standard mechanical equipment, eventually with the use of typical or repeated designs, when only a one-stage design can be elaborated, the general designer elaborates the documentation of industrial projects usually in two stages, i.e. as an initial design and working drawings.

The first stage - the initial design - gives more details to data and technical and economical indices of the investment brief in accordance with the definitive solution of the construction, determination of the technology, extent of the production processes and functions of the construction, and its division into operational departments and buildings. The standard of indices of an investment brief must not be deteriorated by the definitive solution.

As regards the first phases of elaboration of initial designs, the technical and economical conception of the construction or its decisive parts can be ensured also by alternative solutions, from which the investor chooses the most suitable ones, and which are then completely elaborated. The initial design includes also the system of contractors, as well as the respective planning data, and contractual ensurance of all deliveries, including import demands, solves completely the linking of design activities to site work, and to production and assembly of machines and equipment including the finishes. Furthermore, it defines the site and its equipment, indicates the trend line of production, technical conditions and demands of complex tests and of trial practice, indicates the precise needs of employees, energies, materials, determines the transport claims and further factors necessary to the smooth running.

It determines also the total estimate cost of the construction (according to individual buildings and operational complexes), eventually the linking and ensurance of the investment necessitated by the construction.

The initial design of an industrial construction includes on principle:

- a/ an accompanying report with identification and initial data including a short survey on the division of documentation,
- b/ a summary report on the construction, containing economic motives, a summary technical report and drawings,

- e/ a technological part, containing a technical report with necessary drawings and a list of machines and equipment,
- d/ a constructional part, containing technical reports and drawings of buildings and engineering networks,
- e/ an estimate of the construction, containing two types of cost: (i) cost included in the plan of investment, and (ii) other cost which are not a part of this plan (cost of design, documentation, purchase of land and of existing buildings etc.),
- f/ organisation of site processes with a technical report, drawings, and a time schedule of the construction, containing
 - a graph of the process of the design work, with a linking to the transmission of design data and to the process of construction,
 - a graph of the process of construction with a linking of site work and assembly of technological equipment to complex tests and to setting of completed parts into operation,
 - a time schedule of the main volumes of decisive materials, man-power and financial means for the whole course of the construction.

The initial design requires also a broad negotiation on all linkings of the designed construction e.g. connection to public networks, creation of safety zones, solution of other technical, hygienic and fire-protection questions etc., influences on the creation of living standard, ensuring

of principal deliveries and of consumption for future production, including man-power of corresponding skill and qualification and, not least of all, the ensuring of machines and equipment deliveries, and also the time schedule and organisation sequence of site processes with all contractors etc. Eventual differences which arise during the negotiations, particularly differences with contractors in prices are transferred, unless they are settled directly between the acting parts, to decisions of their superior bodies.

The ministries are entrusted with the approval of completely elaborated initial designs, unless they transfer their competence as regards the constructions of smaller extent and minor importance to lower organisation bodies (production economic units - enterprises) The government requires a professional evaluation by its bodies, if an initial design of a particularly important and extensive construction has to be approved. The approving proceeding is preceded by the expert opinion on the initial design, elaborated first of all from the viewpoint of technical and economical standard of the construction and its accordance with the development of the respective branch, including the evaluation of the organisation of site processes and their delays. During the approving proceeding there are also often submitted real amendments, which the general designer must include on their approval into the documentation. In conformity with this procedure, the construction is then placed into the plan and accordingly opened and financed. The financing bank acts here

as a control body, to which the investor presents together with the documentation the copy of the approving record, containing the evaluation of the documentation.

The general designer ensures - in accordance with the initial design - the elaboration of the second stage of documentation, i.e. the working drawings, which solve individual technological complexes and buildings in all details necessary to the realisation, control and financing of the construction. The working drawings give therefore, on principle, more precision to the initial design, and show also eventual deviations in the estimate of the construction.

The design departments of the contractors participate usually directly in the elaboration of working drawings or hand over binding and unchangeable documents on their deliveries (e.g. dimensional drafts, foundation plans, dimensions for supply connections, height and weight characteristics, methods of anchoring including the respective acting forces etc., and market prices of deliveries) to institutions entrusted with the elaboration of working drawings. The general designer guarantees by his co-ordinating activity the material and time conformity of all working drawings and sees to the necessary negotiations between individual contractors and or other organisations.

The general designer has also the power to follow the influence of the estimate cost of individual buildings and technological parts to prevent the total approved estimate cost of the construction from being exceeded.

For this purpose he has to follow especially the withdrawal and supply of amounts for unforeseen work and expenses which form a part of the global estimate for the initial design.

The general designer follows in his function of supervisor the conformity of the realisation of construction with the documents, gives his comments to any eventual deviations from the original project, gives explanations to the working drawings and so on, guaranteeing so that, the attainment of results foreseen in the project.

The present situation in industrial project designs in Czechoslovakia as it has been briefly characterised herein above is a result of certain evolution phases during which the extent of individual steps of design documentation as well as mutual relations between the investor, the general designer and the contractors, underwent certain changes.

The original evolution led towards a complete concentration of the design activities in design institutes which way limited the participation of contractors in the elaboration of projects.

The successive enlargement and stabilisation of the production bases, above all in the building and engineering industries necessitated in the following phase to introduce a certain division of work especially as regards the technical solution of details of individual work and deliveries, especially in the solution of technological part of industrial constructions.

Six years ago, a certain part of design activities in a limited extent of the working drawings was entrusted to contractor enterprises which obtained in such a way an opportunity to adapt the detail solution to the technical conditions of their own production. It can be understood that at the same time it was necessary to avoid a certain danger of a possible retarding influence of stabilised technological production method on a design solution.

In the socialist economy the design activities have a specific mission. It has to compensate the difference of various interest of enterprises and of local and social interest and it should serve as a means for the application of results of a planned technical development within the possibilities of the technical standard of the production base.

The most suitable form of solution of this intricate technical and economic questions is the successive extension of application of exact scientific methods, especially the utilisation of calculation technology as an instrument in planning. In the particular project work the use of exact scientific methods serves the technical argumentation of the proposed solutions and the Czechoslovak project organisations are already using these methods especially for technical calculations and for the organisation of building carried out the method of a diagrams.

Methods of determining the economic effectiveness
of investments

The investment plan which is a part of the development plan of national economy, distributes the respective means between productive and social investment. The importance of the productive investment in which we are interested from the view-point of our task, is expressed in such a way that they

- a/ increase the capacities necessary for a steady growth of national economy,
- b/ secure the necessary proportions between individual branches, groups and regions,
- c/ realize the optimum technological progress.

Therefore the productive investments comprise substantially two phases, namely

- 1/ the phase of the primary distribution of means (between individual branches and groups) and
- 2/ the phase where it is necessary to select the most suitable solution from the point-of-view of the needs of the investor.

In the first phase, the determination of the volume of investment is based on the presumed growth of production and on the extent of the utilisation of existing capacities.

The speed with which means are invested, has been increasing rapidly. It is foreseen that during the years from

1966 to 1970 the investment will amount to more than fifty per cent of the amount invested during the last twenty years. It follows that the problems of their effective spending are growing still more important, both from the point-of-view of their correct location and from the point-of-view of a correct determination of their total volume. There is an indivisible connection between the determination of the volume of investment and their global effectiveness, because the mistakes which may be committed in carrying out vast programmes of investment within a short time are bound to increase rapidly. Every mistake affects the living standard because in the financing of investment both amortisation and a share of the accumulation fund are effected which otherwise would be used for increasing the living standard. The determination of share of the accumulation fund for the investment is one of the key problems in the correct solution of this task. The determination of this share is a result of forces acting in opposite directions, resulting on the one hand from the necessities of the already started investment programmes for their carrying out in optimum terms, and on the other hand from the necessities of new constructions against the determined speed of the increase of living standard according to the economic and political directives.

An important standard in deciding in these phases is also the correct location of the investment from the view-point of the distribution of productive forces.

As a consequence of historical development, when in the last century, industry was distributed on our territory in an elemental way with quite different centers of attraction, the material and technical base was excessively atomised. In the period after the first world war, industry was disproportionately agglomerated in a few industrial centers with limited territorial conditions for their development. The atomisation of the material and technical bases finds its expression in the dispersed network of settlements. On the territory of Czechoslovakia having an area of 124,000 km² there are 19,353 settlement units separated in space, from which only 207 settlements exceed the number of 5,000 inhabitants. It is therefore evident that in the development of industry it is also necessary to reorganise the network of settlements. Consequently the decision on the location of new industrial plants must be also based on considerations of factors, besides the traditional considerations relating to raw material bases, transport distances, market conditions the organisational questions (specialisation, coordination and cooperation) on the possibilities of reorganising the existing network of settlements in conformity with the newly arising needs.

It is therefore necessary to consider in this phase of deciding of the economic effectiveness, the following factors:

1. the assumed speed and direction of the growth of production,

2. the level of utilisation of basic funds,
3. the structure of basic funds and the possibilities of their improvement (relation between construction work and technological equipment).
4. The decision on the distribution of investment in which it is necessary to consider some interchangeable solutions like the production of different goods for the satisfaction of the same needs, the choice of different technologies, the satisfaction of needs by an increase of production or by a reduction of consumption by means of some other measure, by utilisation of international division of work in connection with foreign trade.
5. To solve the problem of location of the planned investment.

Besides these "investment factors" there are, however, series of "non-investment factors" which have to be taken into consideration in some way because they are decisive for the level of effectiveness. They are for instance:

1. The arrangement and organisation of the productive technical bases where it is necessary to find the correct relation between universalism and specialization, given by the standard of changing needs.
2. The qualification of the staff, including the skill of workers as well as the ability of engineers and members of technical staff. The solution of this question requires a correct solution of the problems of wage leveling, the removal of disproportions between the capacities

of the linking branches of production, the removal of time losses within a certain production process, the reduction of trouble incidence, the increase of interchangeability of shifts, rapid modernisation serving better utilisation of the production space etc. (There are known examples where the difference in the output of the same equipment amounts to 30% and more if organization of work and operation are improved) .

3. The choice of a suitable working time.
4. The level of the services to the inhabitants and of the supply.

If the construction of the investment is decided from the view-point of the development plan, and the respective region roughly determined, it is necessary to solve still the following questions:

- 1/ To choose suitably the capacity and its technical and economic level,
- 2/ to select the building site (location of the construction) ,
- 3/ to ensure the construction in the optimum time, in order to prevent losses arising from long-term blocking of means in the investment.

These questions are solved by the investor, the designer and the contractors who participate in the course of design and research work, under the coordinating activity of the general designer, in the common solving of principal questions.

In order to obtain the most advantageous solution it is necessary to find and to evaluate other possible and alternative solutions and to carry out the selection of the final alternative on the ground of economic evaluation. In this process it is necessary usually to take into consideration the following circumstances:

- 1/ The possibility of building up a new factory or of modernizing the existing capacities so as to obtain the required growth of production, eventually to obtain more progressive technical and economic parameters,
- 2/ the share of invested means and of human work in the individual alternative solutions,
- 3/ further alternative possibilities of satisfying the demand by some other kind of goods or by imports with the simultaneous solution of a method of obtaining the necessary foreign exchange

Considering the suitability of the proposed construction, it is necessary to take into account on the one hand the general situation and on the other hand, a system of indices showing its technical and economic level.

General considerations:

An important factor in the general considerations is the economic, political and social contribution of the industrial plant for the regional development.

Special attention in this sense is particularly paid to

the regions with a lower degree of economic development, as well as to the improvement of the structure of basic funds (ratio between construction work and technological equipment). One of the most striking examples of the application of this method is the successful industrialization of Slovakia, which means an unprecedented economic and cultural development of this formerly neglected region.

This is evident from the fact that the value of basic funds in industry increased from the year 1955 to 1963 on the whole 1,6 times, in Slovakia 2,1 times and in the building industry on the whole 2,1 times, in Slovakia 3,1 times, in agriculture on the whole 1,7 times and in Slovakia 3 times.

The successes obtained in the improvement of the structure of basic funds were equally important.

The development of the structure of basic funds -

the year 1948 = 100

National economy	Total	From this the machinery and equipment
1955	136,1	122,1
1963	227,7	326,4
in the industry		
1955	143,7	243,7
1963	215,1	442,2

As a consequence, the machinery was substantially renewed (in the year 1962 already 50% of the machinery were not older than 5 years and 70% of the machinery not older than 10 years) and the technological equipment was substantially improved in relation to work (in the year 1962 159,6, in comparison with 1948 = 100).

In judging on a project of industrial investment also the consequences for the so-called indirect investment costs have to be followed, arising as a consequence of the intention of building up an investment in other contact branches of production or services, transports, housing and other non-productive buildings sometimes called the social infrastructure. The evaluation of such consequences is sometimes necessary especially if the building up of important industrial capacities is involved. For the determination of the means necessary for indirect investment, it is necessary to take into account the intended location of the industrial plant already in elaborating the regional territorial plan. These consequences ensue from the development of the whole settlement. The question of evaluation within the framework of settlement is very important especially in conditions of a dense network of settlements which is characteristic especially for the settlement in Czechoslovakia together with a dense network of transport roads, unfavourable water conditions and other territorial conditions like for instance the transport of employees and workers to the place of work.

The question of agricultural land of outstanding quality, the extent whereof is absolutely limited and decreases as a consequence of the use of land for the building up of industrial plants, acquires a large importance in the solution of these problems.

The evaluation of a project of an industrial plant without taking into account the considerations following from broader territorial relations and the consequences for the development of settlement can lead to cost excessive from economic view-point for instance of social infrastructure is developed in one place while it is already built up elsewhere without being sufficiently utilised.

The evaluation of a project of an industrial plant cannot be done in an isolated way without taking into account the interest of the whole society and without a complex evaluation of all consequences influencing the social and cultural life of people, their happiness and therefore without taking into account elements that often cannot be expressed in figures at all.

In spite of that it is necessary to make the criterion of ~~consequences for the whole society~~ an indivisible part of evaluation of industrial project already in the phase of the preparation of designs.

Among the factors of social character influencing the productivity of work is the influence of the ~~working milieu~~, existing in the operation of the already finished industrial

plant. It is absolutely necessary to take this factor in consideration already in the phase of the preparation of designs. This category involves also influences of working safety and hygiene, as well as climatic, acoustic, optical and artistic elements which are sometimes difficult to express in figures but their effect on man influences the productivity of work and the health of employees. From the national point of view, important economic losses can arise this way.

In the global considerations the following questions are usually also solved: the optimum size from the view-point of specialisation and either present or future cooperation, the proposed technology, the supply of raw materials and energy, and the location of the site of the construction from the view-point characterising bearing power of the soil, sloping of the site, the prevalent direction of winds, the aesthetic and architectural aspect of the designed construction.

System of indices

A system of indices based on natural and value indices, is an instrument for the consideration the various alternative solutions from the technical and economic point of view. The use of natural indexes, e.g. the productivity of work in technical units, the need of the main raw materials in technical units, the consumption of energy etc., is considerably

limited and cumbersome because it requires comparable conditions of the investment to be judged upon with the structure of the index serving as a standard and a very extensive list of compared indices.

For this reason the so-called synthetic indexes are used to a much larger extent, which are based on the cost expressed in values, including both investment cost operational cost.

In this connection, the problem of a global criterion which could be used as a measure for judging on the effectiveness of the prepared investment acquires an outstanding importance. Long theoretical discussions showed that such a standard can be formulated in the terms of a measure of the satisfaction of present and future needs of the society as a result of the realization of this investment.

A quantitative expression of the global criterion is the growth of the volume of national income and the necessary material structure together with the eventual saving of working time achieved as a consequence of the investment of the real volume of accumulation.

The examination of the effectiveness of various economic investment plans on the basis of a global economic criterion must be always done by means of a broad economic and social analysis of all compared alternative solutions from the point-of-view of the proportions resulting from such plans in national economy.

The main complex indices which are most currently used are the following:

The specific investment cost, namely the non-recurring cost needed for the building up of the respective alternative solution of the construction in relation to utility unit:

They are determined by the relation: $I_m = \frac{I}{M}$

where I = the total investment costs

M = the utility production unit (capacity)

Whereas the examination of the effectiveness of investment construction takes place in several levels it is necessary to include, in the different levels, a different extent of cost into the investment cost. From this point-of-view we divide the investment costs in direct cost necessitated by the construction and indirect cost.

a/ Direct investment costs

We consider as direct investment cost this cost which is immediately connected with the realization of a given plan of a construction or respectively of a given construction. Consequently it includes, besides the presumed estimate cost determined by the solution also the cost of design and research work, the cost for the purchase of land, or the evaluation of losses arising from the use of agricultural land for industrial purposes, the cost of the purchase of real

estate and of the rights, the non-recurring cost for the putting into operation of the built up investment, the cost of the purchase of patents and licences, the cost for the maintenance of the management of the developed plant, the cost for the training of the staff and for securing the operation in the future plant and the cost of the volume of circulating means which have to be invested into the plant which is developed in order to secure its operation.

b/ Investment cost necessitated by the construction

The investment cost necessitated by the construction is such an investment cost which makes it possible to utilise the chosen alternative solution on a chosen territory like for instance the building up of the necessary communication and side tracks, river bank protection. This investment cost can be evaluated according to the degree of importance, in several areas.

c/ Indirect investment cost

The indirect investment cost is the investment cost in the contact branches where the production or activity are used as technological raw materials or services in the prepared alternative of construction and which is immediately connected with the given solution like for instance the investment for the development of mines, transport, water-works etc;

the specific production cost proper is this total production cost of a useful production in relation to a unit of the respective production;

it is determined by the following relation : $P_n = \frac{P}{V}$

where P = the yearly production cost proper

V = the yearly production

In comparing the economic effectiveness in particular cases of solutions, we take as yearly production cost proper and yearly production the average values obtained in the first years of operation of the built up investment after its complex testing. The same way as in the case of investment cost, the production cost proper is divided from the point of view of their arising into

the direct production cost, that is the cost arising directly to the operator of the given investment, and

the indirect production cost, that is the production cost in contacting branches, caused by the operation of the given investment;

the coefficient of economic effectiveness, characterising the relation between two or more alternative solutions which eventually differ from each other in production cost proper as well as in investment cost in such a way that it expresses the relation between the obtained savings in a year of production cost proper and the increase investment cost spent for the purpose.

In the analysis and mutual comparison of the alternative

solutions it is necessary to concentrate on the selection of such alternatives which are characterized at the same time by the lowest production cost as well as investment cost. If any such alternative solution exists, it is called the "absolute effectiveness".

If in comparing mutually two alternative solutions we find that in one of them the investment cost is higher while the production cost proper of this alternative solution is lower, we call it the "relative effectiveness", because the advantages of one or other solution are given by the relation between the investment cost and the production cost proper.

The coefficient of economic effectiveness of this so-called additional investment is determined by the relation

$$k = \frac{V_1 - V_2}{I_2 - I_1}$$

where k = the coefficient of economic effectiveness

V_1, V_2 = the production cost proper of the examined alternative solutions

I_1, I_2 = the investment cost of the examined alternative solutions.

In cases, where reconstruction of plants is involved, the following adapted relation is used:

$$k = \frac{V_1 - V_2}{I}$$

where I = the investment cost of reconstruction, expressing the savings obtained by reconstruction for the investment which was necessary in the reconstruction.

The coefficient of economic effectiveness expresses in its inverted value, the time of amortization (term of payment) that is the time within which the additional investment of the two alternatives being compared will be paid up by the yearly savings of production cost proper.

The calculated coefficient of economic effectiveness has to be compared with the standard coefficient of economic effectiveness of additional investment (k_m), fixed for the given branch or sector.

The standard coefficient of economic effectiveness results from the material proportions of national economy and is fixed in a differentiated way for the individual branches or sectors. In the present conditions of the development of Czechoslovak national economy, the proposed coefficients for branches and sectors are within the minimum range between 0,1 to 0,3.

The standard coefficient of economic effectiveness cannot be used in the original distribution of investment between the branches, because the effectiveness of the investment plan of development is a part of the total effectiveness of economic development and therefore the coefficient of its effectiveness can be calculated only after the balance of the whole plan has been made with due regard to the obtainable effect in individual branches of productions.

The judgement on the advantages of a solution by the calculation of the coefficient of economic effectiveness of an

additional investment (additional investment mean: the difference of investment cost between the considered alternative solutions) and its comparison with the standard coefficient of economic effectiveness is possible in comparing two alternative solutions. In comparing more alternative solutions it is impossible to use this process without difficulties and consequently it is suitable to proceed to the determination of the optimum solution from among more alternatives with the method of calculation cost.

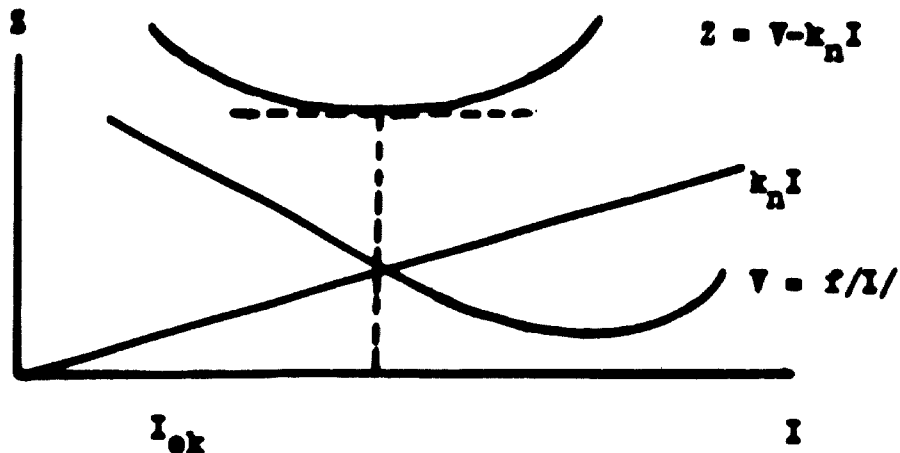
Calculation cost characterizes the relation of more alternatives which eventually differs from each other on the one hand by the production costs and eventually by the investment cost in such a way that the yearly production cost is added to a part of the investment cost determined by the product of the investment cost and the standard coefficient of economic effectiveness.

In judging on the advantages of the solution concerning investment from among a larger number of alternatives taken into consideration, the most advantageous is the alternative where the calculation cost is the lowest.

The relation: $Z = V + k_m I$ applies here.

The calculation cost represent a method of determination in figures of the complete consumption of social work on a given production in a particular enterprise, respecting not only the consumption of work in this enterprise but also in the other enterprise of the society, caused by the allotment of the investment means to a particular construction.

The curve of calculation cost is determined by the sum of the ordinates of the curve V and of the line $k_n I$. The curve V is based on the circumstance that every production process has a certain functional dependence of the production cost on the investment cost because of investment cost is increased, technological equipment, mechanization, automatization etc. are increased too, which way the consumption of raw materials, fuels, energy and manpower on a unit of production are reduced so that consequently, the following relations applies:



Point I of this curve corresponds to the most economical alternative and the value I_{0k} means the limit up to which the increase of investment cost can be economically justified.

The realisation of the investment leads necessarily to the consequence that a part of national income is exempted during the construction from active participation in the economic process. The aim is to make the time of this non-

-productive blocking as short as possible, so as to solve the contradiction between the possible and necessary volume of investment in each particular time by distributing the means in a way bringing the highest effect within the shortest time possible.

In order to be able to judge on, and to compare, individual alternative solutions, it is therefore necessary to express in the calculation also the ~~influence of the time~~ factor, especially the influence of various construction terms on its effectiveness.

It is necessary to add further to the investment cost of the alternative with a longer term of construction the economic effect, which could be obtained from the investment means spent on this alternative during the prolonged term of construction in some other sector of national economy, according to the value of the corrected increase of national income in the relation to a unit of the increase of the basic production funds. At present in view of the development of national economy of the loss resulting from the unproductive binding of means is equal to $k_u = 0,15$.

The losses resulting from various terms of construction have to be expressed, in order to simplify the calculation, as losses resulting from the amortisation of investment means spent in individual years of construction and in comparing the alternative, it is necessary to add these losses to the investment cost.

This process can be expressed with the use of the compound interest calculation in the expression of losses (savings) on cost spent once for all in a given alternative in connection with the different terms of construction according to the following formula:

$$N_1 = \sum_{j=1}^{j=t} I_{1j} \left[\frac{(1 + k_u)^{t-j+1}}{H} - 1 \right]$$

where N_1 = means the loss on cost spent once for all in the alternative "1" in connection with the unproductively bound means during the time of construction.

I_j = means the investment cost of the alternative "1" spent in the year j of the construction,

k_u = means the unified coefficient for expressing the loss resulting from unproductive binding of means,

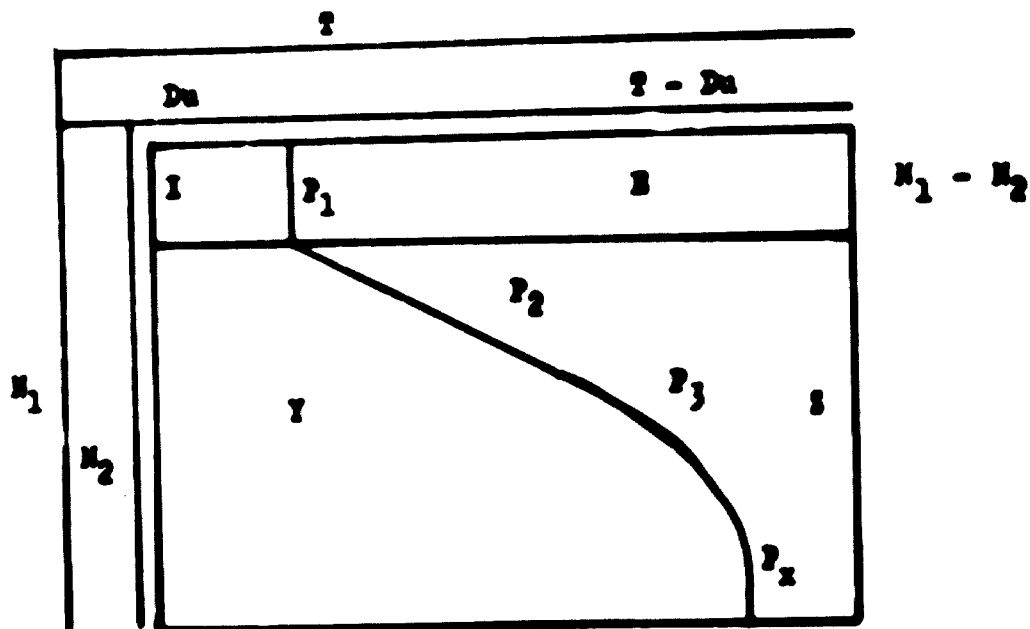
j = means the first $/j=1/$, second $/j=2/$ to the last year of construction $/j=t/$

t = means the term of construction

H = means the coefficient expressing the even spending of investment cost during the year, which for $k_u = 0,15$ is equal to $H = 1,071$.

Another method of selection of alternatives with a different term of amortisation and with different investment cost is the method by means of the so-called isoquant, that is a line connecting all alternatives giving the same

effect /E/ during the service life of the investment.



T = the service life of the investment

D_a = the time of amortisation $= \frac{1}{k}$ where k means $\frac{N_1 - N_2}{I}$ /

I = investment cost

E = the effect of the investment during its service life

$$/T / N_1 - N_2 / - I /$$

$P_1 \dots P_x$ = an alternative giving the same effect like the other /they all lie on the line expressed by the following equation/

$$E = /N_1 - N_2/ \cdot /T - D_a/$$

where the expression

$N_1 - N_2$ means the yearly saving of operation cost.

Alternatives /Y/ situated inside the isoquant are more advantageous than the compared alternative P_1 . The alternatives /Z/ situated outside the isoquant are not economical /they have a lower effect with higher investment cost/.

The trends of evolution in the evaluation of the economic effectiveness of industrial investment

At present the principles of the planned control of national economy are being more thoroughly elaborated creating new conditions for the evaluation of economic effectiveness.

In the new system of management, investments will be distributed into two big groups: into development investment, remaining within the competence of the center and branch, and enterprise investment which pass into the sphere of the autonomous accounting of the enterprise. The action of the autonomous interest of the enterprise, based on the interest of the enterprise in the increase of its either brutto or netto income will become the decisive standard for the selection of such investment on the basis of their enterprise effectiveness - rentability (profitableness).

This of course does not mean that the system of indices mentioned in the last chapter will lose its importance. On the contrary it will be in the interest of the enterprises to use such indices in order to achieve a correct selection and decision in their investment programme. The same way, such indices will be used by the supervising authorities and by the bank granting credit for such investment.

The minimum profit required in an investment will have to be sufficient for the payment of the contributions to

the society (contributions from basic funds and from the increase, from the brutto or eventually netto income) for covering the costs of wages in connection with the investment and for the payment of the instalments to repay the credits granted for this investment, including the interests. This changed function of the indices is in harmony with some trends of the new understanding and valuation on the function of the normative coefficient of effectiveness, where the following three basic factors are taken into account:

- a/ to identify the normative coefficient with the standard of profitability of the investment that is to derive the normative values not from the point of view of obtaining minimum costs but from the point of view of obtaining maximum of profit. The normative coefficient understood this way is determined by the average profitability of the branch because new investment should not deteriorate the average already reached;
- b/ in the second meaning, the normative coefficient is understood as one of the means of obtaining an optimum plan, which problem can be solved by means of a mathematical model and analysis. From this way of understanding, the normative coefficient represents a special "Price" of the investment serving the purpose of finding an optimum distribution of investment with a limited fund of accumulation, the standard of this optimum being

either the minimum of production cost, the maximum of profit or the maximum of labour productivity, or any other chosen standard;

c/ the derivation of the normative coefficient in relation to the consumed work in the past, the live work and the profit in the value of the product, from the examination of the relation between the production cost proper and the value of the product in connection with the turnover of the funds. This third way of understanding is nearest to the hitherto way of understanding of the normative coefficient.

This method taking as basis above all the valuation of the above quoted four complex indices is being constantly tested because in spite of its progressiveness it still shows some drawbacks:

a/ the time factor is taken into account in the present method practically only in the form of the calculation of losses resulting from the amortisation of the investment means during the time of the construction. In reality however the whole development of national economy takes place in time, therefore also the investment policy, while the speed of development of different factors of national economy is different. The time factor has to be therefore taken in the account from a broader point of view, for instance with respect to the dynamic process of development of technology and of social and eco-

nomic relations, laying more stress on the duration of the physical and moral service life of the investment, on the speed of the development of labour productivity as a result of the use of new technology etc.

b/ The above characterized method secures the selection of the economically more advantageous alternative from among a number of given solutions without any objective guarantee of the real effectiveness of the chosen alternative as such. For judging objectively on the effectiveness of the chosen alternative solution it is consequently necessary to add to this method further artificial bases of comparison like for instance the level of the last construction, the average in Czechoslovakia, the world standard etc. This method does not consequently guarantee that the selected alternative corresponds to the optimum possibilities of technical development, to the useful distribution of new technology among various branches and sectors.

c/ The production cost is included in the calculations of effectiveness of the investment according to the hitherto used method by yearly average amount on the basis of assessment, usually in its most favourable amount, that is from the period of the maximum utilisation of the developed investment after its full building up. The real average amount of the production cost is, however, different and depends on the one hand on the time and on the way in which production is developed on the time of

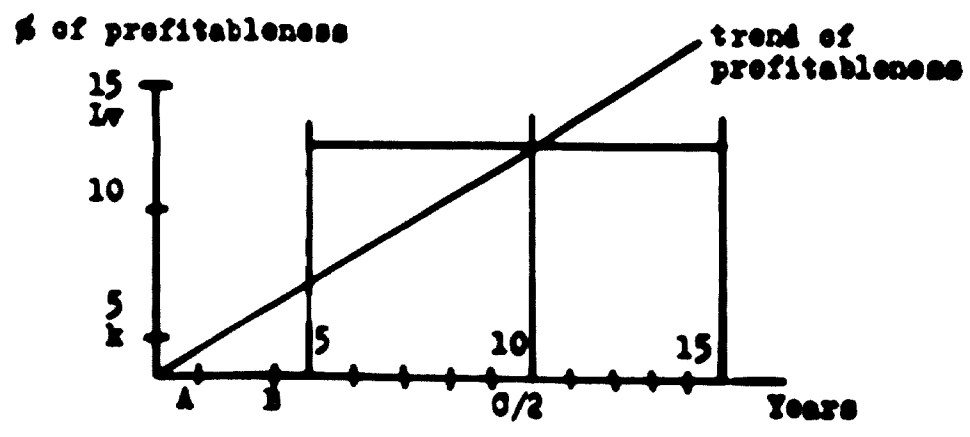
the service life of the investment, on the possibilities of further mechanisation and automatization in the evolution in time, on the way of the organisation and realisation as well as on the extent of general repairs etc.

4/ The selection of the most advantageous alternative of the solutions of investment according to the hitherto used methods is done by comparing the differences between the investment cost and the production costs proper. The changes of the standard coefficients of economic effectiveness and the changes of prices of the products can, however, have an influence in the sense that we are choosing an alternative as economically more advantageous, in spite of the fact from the point-of-view of the enterprise it is not profitable. At the same time, however, the standard coefficient of economic effectiveness, the investment cost and the production cost proper are based on the given particulars of the balance sheet, determined on the basis on the prices now in force. The contradiction between economic effectiveness and profitability motivated by the level of prices is therefore not quite well founded.

The basis for the selection in this sense will be the economic effectiveness of the investment, measured of course above all by the indices of enterprise profits. This profitability will have to be understood of course from a dynamic point-of-view that is with due regard to the time of construction and to the time of the service life of the

investment. It will be therefore necessary to fix for individual branches the minimum limits of profitableness the observance whereof will be a condition for the inclusion of the given investment into the plan from the point-of-view of economic effectiveness.

The working out of the notion of the minimum limits of profitableness is based on the state of technical and economic level of the investment development, measured by the standard of profit in relation to the basic funds according to the formula $E = \frac{Z}{I}$, which result from the statistical ascertainment of the said technical and economical level, and from the part characterising the anticipation of the expected technical development and the resulting increased profitableness during the time of the preparation of the development, and taking into account a half of the service life of the construction. This method is now being tested in its statistical part as well as in its formula expressing the influence of the time factor in discussions of the competent branches of public administration. This principle of profitableness can be expressed in the following diagram:



For the transition period, before the improved principles of control of national economy will be fully developed, such limits of profitability have to be differentiated according to the branches and groups and their use will be possible only after the evaluation of comparable investment and alternative solutions in the same branch or in the same group.

The technique of the selection of alternatives advantageous from the point-of-view of economic effectiveness for inclusion into the plan of investment construction will have to be adapted further within the meaning of a more intense utilization of considerations on the likely trends of development. National economy is a complex of mutually acting and influencing factors, while it is impossible to express in figures the degree in which one factor will influence the development or respectively the stagnation of some other factor.

In selecting the most advantageous solutions it will be necessary to use the method of successive valuation of the individual factors and of considering for instance the extreme average limits within which this factor will be able to act and within this limits, the possible limits of the action of other factors will have to be valued in an analogous way.

This way there will be successively created a branched chain of possible solutions, from which it will be neces-

easy to select the optimum solution with respect to the whole complex. For such work, statistical data and various ways of their treatment, above all their evolution trends and the likely degree of deviations will have to be taken into account. The technique of working out a proper solution will require, in the interest of a really optimum decision on the investment construction, a treatment with the use of higher calculation methods, above all the use of automatic computers, without which it would be impossible to find objectively the optimum of all variable inlet parameters.

The influence of the State policy on the investment programme will be carried out by economic instruments namely by an elastic policy of prices, by the financial policy and by the selection of actions for the construction. This way the interest of the State in a differentiated programme of investment from the point-of-view of regional, branch and sector interest, will be safeguarded, while maintaining a unified level of the normative coefficient.

Conclusion

In concluding it is necessary to examine again the task of investments in socialist economy in general as an instrument of the economic policy of a given country.

The investment means are used by the State for renewing, improving and enlarging the basic productive and non-productive funds. The investment construction creates and develops the material and productive basis of the State and parallel with further factors secures the principal aim of socialist economy, namely the satisfaction of the increasing material and cultural needs of the people.

In spite of the fact that enormous means are spent on the investment, it is nevertheless impossible to satisfy all needs at once. The material sources and financial means have to be utilized in the most effective way, and in the solution of the economic tasks it is necessary to use the principle of the highest economic effectiveness.

A project of an industrial plant, if understood not only within the narrow meaning of the design documentation proper but also as an intention to introduce a new industrial capacity, is consequently necessary in connection with the evaluation of the effectiveness of investments in all phases of the work in the compilation and approbation of an economic plan.

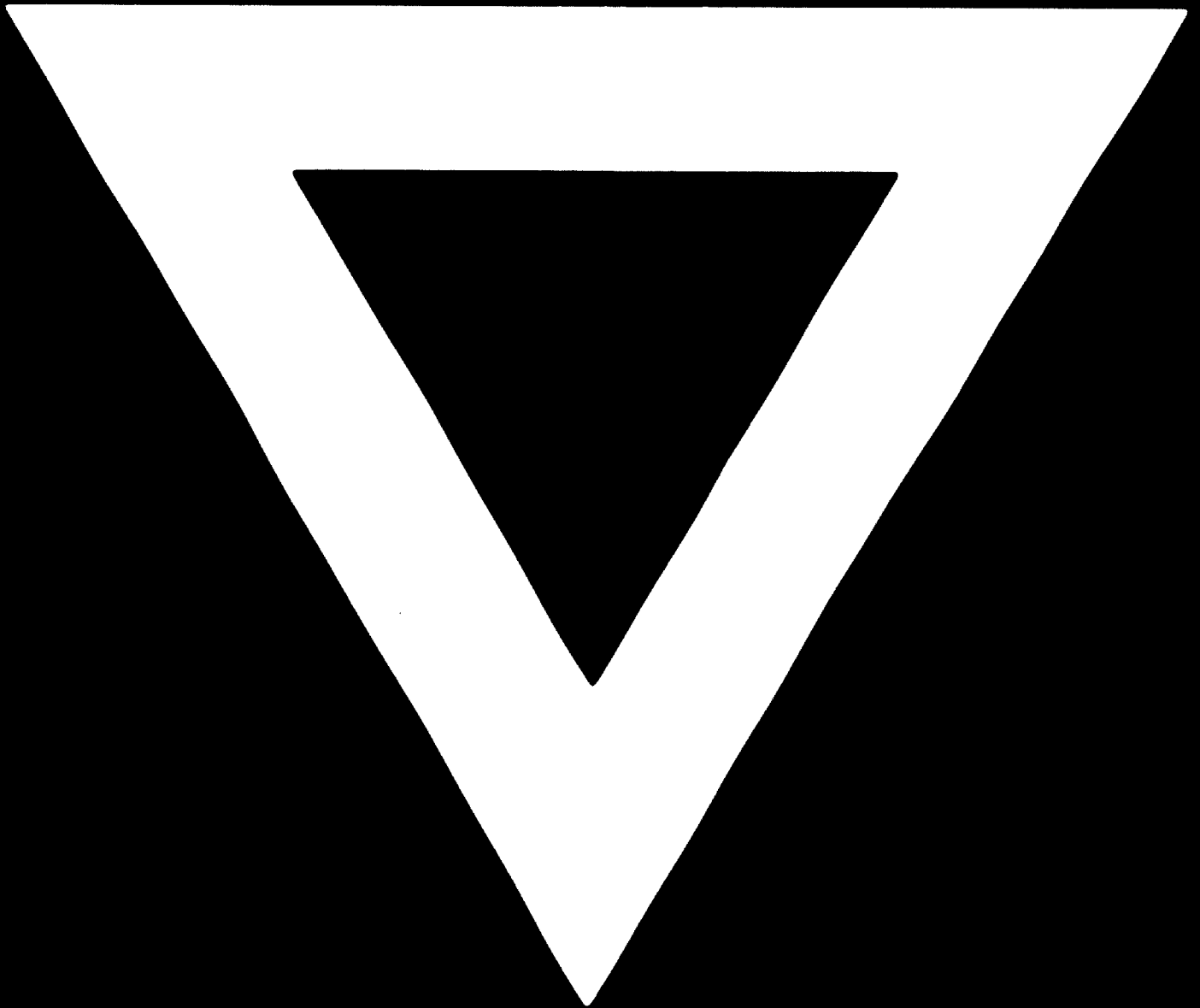
The effectiveness of a project within the framework of investments is a single problem, which cannot be separated from economic planning. The evaluation of a project is in connection with the distribution of investments between branches and sectors of production, from the preparation of plans and projects up to the materialisation of the construction and to the putting into operation of the plant.

Its effectiveness has to be considered further in relation to the regional and territorial conditions and in relation to all its consequences for the other elements forming the whole complex of settlement. In a more restricted sense the project is evaluated in the design preparation proper, it is motivated economically in the individual phases of the project documentation and finally in the technical and economic valuation of the finished plant.

Particular cases of evaluation of projects of industrial plants in Czechoslovakia are quoted in a special brochure, which the host country presents to the participants of the Symposium.



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