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THE NEED FOR LONG-TERM CO-OPERATION BETWEEN THE UNIVERSITIES, RESEARCH ORGANIZATIONS AND INDUSTRIES IN DEVELOPING COUNTRIES 1/

by

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GENERAL CONSIDERATIONS

1. Social, economic and technological progress implies a high interdependance of individual social sectors. In spite of strong tendencies of certain sectors to retain a high degree of "academic independence and leadership" (this is very characteristic of science and education) today it is being accepted that only by longterm mutual cooperation of individual social sectors can a continued and harmonious progress and a rational utilization of available resources of the country be ensured.

Technology causes a string of problems in various sectors and in various levels of national economy and society as a whole. This contribution is not only in introducing new products and improvement the existing ones, but in rational investment, creating new jobs, raising the standard of living the quality and efficiency in health, education, public services etc.

In its introductory considerations this report includes some evaluations of the contemporary technological development, since it objectively conditions a high interaction of scientific research, education and economy.

2. Technological progress today presents a very complex phenomenon. Technology has greatly overcome the field of planning, design and producing certain products and a purely productive method. The following are included in this term: economic and market evaluation of individual programmes, projects and products management and decision-making, rationalization and efficacy in utilizing available resources and production, management in research and development of cadres etc. At one of the international working meetings in Yugoslavia the participants decided on the following definition of the American scientist E. J. Mesthene: TECHNOLOGY IS THE ORGANIZATION OF KNOWLEDGE FOR THE ACHIEVEMENT OF PRACTICAL PURPOSES 1/ In the OECD publication "Technological Forecasting in Perspective" the following definition has been given: TECHNOLOGY DENOTES THE BROAD AREA OF PURPOSEFUL APPLICATION OF THE CONTENTS OF THE PHYSICAL, LIFE AND BEHAVOURIAL SCIENCES. IT COMPRISES THE ENTIRE NOTION OF TECHNICS AS WELL AS THE MEDICAL, AGRICULTURAL MANAGEMENT AND OTHER FIELDS WITH THEIR TOTAL HARDWARE AND SOFTWARE CONTENTS 2/ If we start from such a wide definition and the necessity of an interdisciplinary approach, we can form the conclusion that technological progress cannot be in the exclusive care and authority of technical intelligence.

1/ The Yugoslav Professional Association for Electronics and Automatization ETAN ORGANIZED in 1971, in agreement with some international organizations, and international working meeting on the topic:"Technological Causes of Change in the Contemporary World" and a report was prepared. The next meeting was held in 1974 with a report on "The Determinants of Technological Changes in the Contemporary World" with special attention paid to the developing countries.

2/ E. Jantsch " Technological Forecasting in Perspective".

3. The transfer of technology and knowledge in general is a component part of the economic and technological prosperity of each country today. This is particularly true of the small and developing countries. However, practice shows that the transfer of technology and knowledge which has been accepted as a process apart from own creation, or, on the other hand which has been defined as a routine operation, cannot ensure realistic results in practice. "Imported knowledge and experience" through various channels of the transfer of technology presents only potential which, without creative adaptation in own environment and providing conditions for the further development, of bought technology, objectively puts the recipient into a position of constant technological and economic dependence. "Technological colonialism" is a great hindrance in the economic liberation of a number of developing countries from the influence of the developed ones.

4. A scientist once said: "Science is not a magic wand which you wave over a poor country in order to make it rich". This is very true. Every country has at its disposal certain limited resources for technological prosperity (funds, research and cadre potentials, imported technology, etc.) but an organised approach is necessary in order to utilize them efficaciously and achieve realistic results in practice and to contribute in this way to the economic and wider social prosperity. The need for creating coordination of available resources and interrelated dynamic actions, in the specific socio-economic environment of the country, conditions the development of a quantitative management system of technological development and the transfer of technology. A systematic multidisciplinary approach and a coordination of a greater number of functions, in the first line that of research and development, education and training, the transfer of knowledge, marketing financing and production is the supposition for success. A number of classical management techniques and methods can be used with adaptation for these purposes - strategic planning, organizational structure, project management, marketing and financing management, the cost control, etc.

From the above said there results a close correlation between the levels of development and the practice of management and the capabilities of a rational utilization and directing of available resources and the imported knowledge for technological and economic prosperity of the country. The development of information systems, as a basis for management and decision-making, should also be marked as important factors in the technological and economic prosperity of the country.

5. For some years now, the terms "social technology", "social engineering" etc. have been used in international proportions. This implies a conclusion concerning the correlation of technological and social development. Science, research and development, and education can contribute to the material and cultural prosperity of a country only if their goals, programmes and concrete projects are coordinated with the realistic goals of socio-economic prosperity of a country. Every "mechanical imitation" of the developed countries in defining the concepts and programmes, as well as in the organization and methods of operative action, limits the real contribution to the prosperity of the country.

6. The developing countries have great problems in overcoming backwardness which colonialism had left, and at the same time joining a very dynamic economic and technological progress of the world which is followed by great crises. A number of objective difficulties present objectively high limitations - the degree of development as a whole, an undeveloped raw material, energetic, cadre and research basis, a lack of necessary experience, great social problems and similar. External impulses are necessary - funds for investments, the transfer of technology, know-how and experiences etc. - however, frequently a non-selective approach, insufficient interior capabilities, and a number of constraints on the international market prevent the technological gap from gradually getting smaller.

Although a number of activities are being carried out in the United Nations with the aim of creating equal relations in the international transfer of technology and knowledge, in general, the position of developing countries is not showing any signs of improvement. The transfer of technology is mainly left to the influence of the market, and on the other hand there exists a number of serious limitations - prices and sale conditions, the accessability of technology, the inadaptation to the conditions of the country, information, etc.

7. The research, consultant, engineering and educational organizations of developing countries have not an appropriate position on the international market of knowledge. Experience, methodological and personal capabilities of the developed countries cannot be denied. However, one can objectively conclude that the scope of engagement of consulting and research organizations of the developing countries (on international projects) is not in accordance with the available capacities, knowledge and experience. The great number of individual experts engaged on UN and other projects and programmes of international organizations is a confirmation of this. A number of international organizations pose limits of a formal nature references on international projects and similarly), and there is no particular preference in engaging organizations from developing countries. This limitation at the inclusion in international projects objectively reflects negatively on the development of institutional basis for research, consulting, engineering and education of the developing countries, as well as their mutual cooperation.

The developing countries coordinate their actions through the United Nations and especially in the framework of activities of developing countries, with the aim of achieving an equal position and removing limitations in the international transfer of techology and knowledge. " The Action Programme of Economic Cooperation" which has been adopted by the heads of states and governments of non-aligned countries at Colombo this year, represents a valuable document which defines, amongst other things, cooperation in the field of science, technology and education. In the framework of this, a consistent implementation of the decisions on new dimensions in the work of the UNDP has been insisted on, which are in relation to the consulting services and a broadening of cooperation between developing countries. The identification of research, consulting and education as important factors in mutual economic cooperation of developing countries certainly obligates the international organizations to work out a concrete action programme in that field.

THE NEED FOR CHANGES AND INTERACTION IN THE RELATIONS OF RESEARCH, EDUCATION AND INDUSTRY

8. The developing countries cannot and should not follow the paths, or develop their economic and technological policies by imitating the conceptual programme and organizational solutions of the developed countries. Starting from its specific socio-economic conditions and available resources, each country should work out its own strategy of economic and technological prosperity. High interdependence in social, economic and technological development on the one hand, and limited resources of the developing countries on the other, condition the economic and technological progress of developing countries with the realization of longterm linkage of research, development and education with the needs of accelerated industrialization of the countries. Many arguments can be put in support of this thesis. These are, amongst others:

- the technological, management and market changes in industry are more dynamic and complex than in the other economic fields and to follow them continual research and capable cadres are needed. The limited material and cadre resources all the more imply rationality;

- the achieved level of science and technology implies that the basic creativity in research is the achievement of realistic results, which can be economically and marketingly evaluated in practice. The unused natural resources, undeveloped productive capacities and an undeveloped demand in the developing countries, imply an orientation of the research and educational organizations toward realistic problems of industrial development as a social obligation;

- a successful adaptation of imported technology and knowledge and providing a continual process of innovation is possible only if research and education are continually included in this process;

- the programmes and methods of education at universities which apart from theory do not include practical work (without regard to the degree of development) - that is if they do not find inspiration in the results of research, they cannot provide cadres capable of giving a real contribution to the material and cultural prosperity of the country.

The experiences of developed countries show that this process of linkage is very intensive, that it gives real results and it presents the interest of all parties. At the same time, it is evident that the forms and methods of coordination are differently related to the conditions in particular countries. In other words, the objectives of the long-term linkages of research and education with industry and the expected results can be defined generally - efficiency and rationality in technological prosperity of a country and the inclusion into the international exchange of knowledge - but the specific paths in the implementation of these goals are very distinct in all the countries.

In the developing countries there is no dilemma concerning the necessity of cooperation between universities, industrial research organizations and industry. However, there are certain limitations of an objective and subjective nature, the gradual overcoming of which would make the process of association become more intensive and by which this process would gain in contents and in results. In the further text an attempt will be made to enumerate some limitations which are current more or less in most of the developing countries.

9. An acute shortage of industrial tradition, cadres and material basis for research work is evident, even in modern industrial plants. In these conditions, the development of new technology and the innovation of the existing one, depends almost entirely on the import of knowledge and experience from the developed countries. There are few developing countries, including those which have some industrial research organizations and cadres at universities, which have worked out their own strategies and programme of how this necessary transfer of technological and managerial know-how can be more closely connected with their own research. Transfer is useful and gives necessary effects but only for short-terms. The inclusion of own research cadres in the phase of feasibility studies, planning and exploitation of modern plants may have a multiple advantage - the development of own cadres and a gradual taking over of the process of innovation into one's own hands.

Another great problem is the lack of research capacities in the framework of modernly build industrial plants in the developing countries. The practice of the industrial countries shows clearly that, in the conditions of rapid technological changes, the carriers of the development of new products and technology as well as the continual innovation of the existing ones, are the research institutions and laboratories in the framework of industrial concerns. The developing countries, facing a great shortage of cadres, concentrate, practically with an exception, the creative cadres in so-called independent research organizations 3/. Reality implies objectively such solutions, but it is necessary to understand the need for a gradual creation of the process of forming research and development centres in the framework of large industrial enterprises. It seems that the functions of research and development should be included in the feasibility studies and design for new large plants, even if the implementation came in a later phase. The lack of research and development centers and laboratories in industry itself presents a very outstanding limiting factor in linking industrial and technological institutes with industrial enterprises.

3/ It is obvious from international reviews that the developed countries locate 60% - 70% of their research capacities in the framework of industry. This gives a special stimulation for the development of new technologies and products. In the greater number of developing countries this percentage is minimum.

10. As has already been mentioned, the concentration of cadres for industrial research in the developing countries is in the industrial and technological institutes and partly at universities. The characteristic of a greater number of these institutes is a mainly "academic" approach to research work and on the other hand with a financial support solely from the government and central funds. This support from the state is understandable in the conditions of undeveloped industry and in many cases it is the only possible solution. However, this includes certain problems of which we should mention the following:

- a programme and financial dependence of industrial and technological research on the government objectively leads to the fact that the institutes become a component part of the state bureaucracy;

- the motives and stimulations for achieving practical solutions in practice do not in a greater part come to light;

- there is no corresponding interest of the industrial and technological institutes for long-term cooperation with industry.

It is impossible to give a single model of the transformation of industrial and technological institutes in the sense of achieving greater dependence - programme and financial - on industry. In the strategy of development of each developing country this process should be developed and stimulated. With the strengthening of the industrial sector in economy, the decreasing of the participation of the government in programming and financing industrial and technological research, should present a basis for a rapid technological and economic prosperity and the liberation from the influence of developed countries.

11. Today in the world, and especially in the developed countries, there is an obvious demand for a radical reform of the university system and a basic transformation of the educational process - the programmes and methods of education. There is a demand that the growth and quality of knowledge be in accordance with the specific needs of a dynamic social, economic and technological progress of individual countries. Frequently a conservative, bureaucratic and insufficiently dynamic system of university education cannot follow the changes and demands of economy, technology and other social services - the necessity of changing a profession even several times during a working life, education in the sence of understanding problems - not methods, an interdisciplinary concept in education, the utilization of modern technology in the process of education, the continuous innovation of educational programmes and materials with the results of practice etc. All these changes of condition that instead of "academic independence" of the universities, the progress of education should be based on a high degree of interdependence with the beneficiaries and practice. In this framework technology and management are fields where the cooperation university-research-industry has an exceptional significance.

A fundamental programmed and organized qualitative upgrading of cadres from practice, which in the conditions of dynamic changes has great importance for the development of industry, can be realized only through a close cooperation of educational and training institutions with practice.

The developing countries form their own universities with the aim of accelerating their economic, technological and cultural prosperity. A number of limitations of an objective nature stand in the way of the affirmation of these universities - a shortage of university professors, inexperienc , undeveloped research ork at universitie , insufficient equipment etc. In these conditions, the influence of universities of developed countries is strong. Transfer of programmes, educational material and methods from these is very often without the slightest adaptation to local conditions and needs. If one adds to this the fact that the universities are practically exclusively financed by the government, than one can conclude that there is little motivation and there are not many conditions for the necessary adaptation of the programmes, contents and educational methods to the local socio-economic situation. All this is reflected in the cooperation of the university with industry. This cooperation is in practically most of the developing countries rather platonic, i.e. it does not result from the material and programme interconnection of both partners.

As in industrial research, the universities in developing countries should be more closely linked - by programmes, contents and educational methods - with industry. This is certainly a process which should be separately directed and stimulated on the part of society. An accelerated development of university education in developing countries, but in close correlation with the needs of the country and in long-term association with industry, scientific research and other social sectors, is an important factor in forming and keeping the political, economic and technological integrity of the developing countries.

12. We have already stated that there exists a close correlation between the levels of development and management practice on one side, and the capability of efficiency utilizing the availabel resources of the country and imported knowledge and technology on the other. Management has effect on creating cooperation between uni ersities, ressarc' organizations and industry.

In view of introducing effective concepts, methodological background and management practice, the developing countries are, without exception, in a very unfavourable position. The lack of own experience is a fact. The developed countries, through various educational and training programmes, consulting services etc. offer a number of programmes and solutions for introduoint so-called modern management. The United Nations, various financial corporations etc., stimulate, and in some cases condition, the engagement of organizations or experts from developed countries for improvement of management system. This transfer is necessary, but most often it takes place without the sufficient capabilities of recipient countries to adopt the imported knowledge to the local conditions and to intensify the creating of an own institutional basis. In such a situation there comes to a mechanical transfer which can create foreign influences in the economic and political orientation of the country. It is necessary to point out to the wide-spread occurrence of forming branch offices of various research and consultant organisations of developed countries, which often has as a result a direct subordination of the already very lacking cadres to the interests of the developed countries.

It is not easy to overcome such a situation and it requires time. The way to do so is in the clear determination for creating own concepts of management which correspond to the features of socio-economic development as well as in intensifying own research, consulting and educational basis.

CONSULTANT ACTIVITY AS A BRIDGE BETWEEN THEORY AND PRACTICE

13. One of the definitions of consultants as given by UNIDO is 4/

"Consultants are a professional problem - solvers whose expert knowledge may cover a number of traditional professional fields, and who are particularly qualified to undertake an independent and unbiased study of a given problem and reach a rational solution. The value of a consultant lies in his training and previous experience in the solution of related problems, and in his ability to select the course of action which, in his expert opinion, should be implemented".

Consultant activity, whether it relates to the field of technology, management or techno-economic or economic studies, presents the application of scientifically based knowledge and methods with the aim of rational and efficient utilization of available resources, a selection of technological, market and investment solutions, the preparation of development strategies etc. Therefore, the consultant activity is basically multidisciplinary research, oriented toward achieving realistic results in practice. The interconnection with engineering and design is natural, which implies even more the applicable character of consulting. The training of cadres of enterprises and their inclusion in consulting projects creates conditions for achieving practical results and preparing qualified cadres for the further innovation process.

Finally the consulting activity is a very influential factor in the international transfer of technology and knowledge. Having in mind that it is actively engaged in the building of industrial objects, feasibility and various techno-economic studies, the developing and introduction of new products and technology etc - the consultant activity presents and effective channel for the economic expansion of developed countries. There are no reliable acts concerning the volume of consultant activity. Looking through some publications one can conclude that today the consultant activity directs over 150 billion $ investments and that the volume of the consultant activity itself is near 20 billion $ 5/. These indicatores point out that the consultant activity is an important factor in the international exchange of goods and services.

14. The consultant activity of the developing countries lags behind the real needs of the country. Faced with the lack of tradition, cadres and experience, the developing countries appear as great users of consultant services. An encouraging fact is that a number of industrial and techno-

4/ UNIDO "Manual on the Use of Consultants in Developing Countries", New York, 1968.

5/ Data used from the American magazine "Consultant-engineer", August 1971, The British magazine "Consultant-engineer" May 1974 and material of the IV International conference of Management Consultants - Copenhagen, 1972.

logical institutes are introducing special departments for techno-economic studies, management and similar fields with a consultant attitude toward business. However, this is only a beginning. The consulting approach toward research is being accepted very slowly. There is not enough professionalism and motivation for achieving real results in practice, and there are not many developing countries which have worked out long-term policies for the development of own consultancy, institutional and cadre basis in accordance with real needs and socio-economic conditions of the country.

It is natural to expect, and this is an acute need as well, the building of an institutional and cadre consulting basis in the developing countries. The very fact that the "Action programme of economic cooperation", which the heads of states and governments of the developing countries adopted in Colombo, has a part which deals with the development of consulting activities in the developing countries and the broadening of mutual cooperation. It shows that the conceptions have matured of consulting being being the most outstanding form of applied research orientated towards realistic results in practice, that is, that it presents a bridge between research, education and industry.

It is of interest to show the possible paths of developing and building consulting in the developing countries. Each country, according to its conditions and available resources, should define this strategy. One of these paths is certainly that this institutional and cadre basis should be developed in the framework of technological and industrial institutes. This can have a double significance - the available cadre is rationally used, and on the other hand the consultancy projects present a realistic link between research organizations and industry. In this case, the creation of a methodological basis and effective training of research staff in "Consulting Technology" is the way to prepare both - the institutions and cadres for performing this kind of applied research. The assistance of the United Nations in preparing consultant capacities of developing countries, which was minimal in the previous period, can be of great value.

15. It is also in the interest of the universities of the developing countries that the consultancy services be strongly developed. One of the valuable profits is that the educational cadre can through participation in the consultant projects acquire practical experience which is necessary for the modern process of teaching. However, on the other hand, consultant projects present a very rich treasury of knowledge and material for conducting instruction (case studies, practical training of students etc.) This once more confirms the thesis of consultant activity as a bridge which connects theory and practice.

SOME YUGOSLAVIAN EXPERIENCES

16. The basic characteristic of the post-war economic development of Yugoslavia was a strong process of industrialization. A significant growth of industry (the average growth rate of industry in the period 1947-1967 was 9,6%, and later a bit slower) conditioned structural changes in Yugoslav economy - the participation of industry in the national income grew from 25,8% in 1947 to about 50% in 1975. Industry became the dominant factor in the further economic prosperity of Yugoslavia and in the expension on the international market.

Parallel to the growth of industry, the research centers were developed in all areas of industrial and technological research. Today there are about 300 institutes and centers in economy which are orientated toward industrial, technological and agricultural research, with about 7000 research-workers. Whilst in the first phase of industrialization the concentration of research cadres was nearly solely in so-called independent institutes, today, the greater number of large industrial enterprises has its own institutes or research-development laboratories. Over 30% of the total number of research-workers is located in industry and other economic branches. When comparing this with the developed countries, this relation still is not satisfactory, but the participation of a research basis in industry is increasing.

University education has also had a very strong expansion. Yugoslavia is included in the list of countries with the greatest number of students per capita. A great number of universities have been formed, and now there are 16 university centers in Yugoslavia. The building of university centers in industrially developed centres is characteristic and through this a direct linkage of industry and educational and research capacities is implemented.

17. The socio-economic system of Yugoslavia, based on self-management, objectively contributes to the broadening of cooperation between industry, research and educational organizations. Certainly the most outstanding indicators of this cooperation are the financing recources of research and educational organizations. After the period of the complete financing of research on the side of government funds, a process has begun of decreasing the participation of the funds, and the increasing of industry itself and economy as a whole. Today the participation of state funds in applied industrial and technological research amounts to only 10% (between 5 - 20% in various institutes). Even in the financing of universities, the participation of industry and other interested enterprises and institutions is growing. After the period of total financing by state-funds, the state participation was decreased in 1968 to 92%, in 1969 to 88% and in 1971 to 75%, with a further tendency of decreasing. The participation of industry is greater in graduate and upgrading programmes, than in the regular programmes.

Self-management agreements are certainly a very important institutional framework of integration in industry, as well as in the long-term cooperation of industry, research organizations, universities, trade, banking etc.

They are actually long-term agreements by which the goals, interests, programmes and activities are defined, as well as the rights and obligations of all parties in their realization. Although this form of co-operation is relatively new, there is a wide application of it in practice and it enables radical changes in the relation between industry, research, and university organizations. This enables the overcoming of the classical selling of services on the part of research organizations to industry, and the transition towards long-term mutual associating with common goals and programmes.

18. In Yugoslavia there exists today a great number of these agreements which differ in form as well as incontents. We will limited ourselves in the further text by giving only a few illustrations of some of the applications of long-term agreements on cooperation of universities and research organizations with industry:

- in the framework of industrial centers, the industrial enterprizes were the initiators and primary financers for the forming of specialized research and university institutes. For example in Zenica, the most developed metallurgy center in Yugoslavia, there has existed for a longer period now a very successful association of the metallurgical combinat, the metallurgical institute and the faculty of metallurgy. This long-term association has given very real positive results and it expresses the needs and interest of all participants. The combinat has been developing very rapidly and it successfully follows all the technological changes; the Institute has a high affirmation in the country as well as internationally; the Faculty achieves high quality of education because it has at its disposal the results of research and practice. Relations in the industrial basin of cooper - Bor, as well in the center of the automobile industry - Kragujevac, have been put on a similar basis, with the difference that the research centers are located in the combinats themselves.

- the School for Electrical Engineering of the Sarajevo University has a close cooperation with one of the greatest Yugoslav enterprises in the field of electrical engineering "Energoinvest" Sarajevo. This long-term cooperation includes: financial assistance in putting up the buildings and equipment, the utilization of research institutes and a computer center of the enterprise for the needs of education, consultations in preparing of educational programmes etc. The same school has a long-term agreement with the electrical utility enterprises in the Republic of Bosnia and Herzegovina for implementing educational programmes - regular, graduate and upgrading - which is of interest to this group of industry. It also includes the financing of education as well as the acquisition of the necessary equipment,

- the School of Mechanical Engineering of the Novi Sad University has a great number of long-term agreements with industry in the Autonomous Province of Vojvodina, and they include common research work, as well as the regular, graduate and upgrading education

of cadres from these industrial centers. The agreements include the financing of education and the research from common interest,

- the Institute for Chemistry, Technology and Metallurgy in Belgrade has formed a special scientific-research group for the research for the need of the industry of synthetic fibres. The same Institute has several long-term agreements with other enterprises concerning common research,

- the School for Mechanical Engineering of the University of Belgrade has a long-term agreement with the Associated Industry of Machine-building (MAŠ) which include technological research, common development programming, etc.,

- the School for Economics of the Belgrade University and the Chamber of Commerce of Belgrade signed a long-term agreement in 1971 on the cooperation which would include a greater number of activities:

  a) training courses for the innovation of knowledge of cadres working in practice

  b) the common programming of graduate studies for the needs of the Belgrade economy

  c) a common selection of topics for master and doctoral thesis

  d) cooperation in organizing practice for regular students

  e) studies and analyses for the needs of Belgrade industry.

  The same School has signed a number of other agreements with industry, commerce and other interested organizations. On the basis of these agreements, the School of Economics provides over 35% of its financial resources. This also renders possible the promotion of the process of education and research.

- Certain results have been achieved through the cooperation of the University and Economy in the field of research and development. A survey of the Yugoslav Chamber of Commerce 6/ from 1971 has shown that the number of research agreements between universities and industrial enterprises has grown in 1969 to 570 compared with 308 in 1968. The value of the agreements has grown by 70%.

- Over 250 industrial and agricultural enterprises and banks have in 1971 signed agreements in order to help education in the field of management and organization. With this agreement all the

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6/ The Survey included 95 of the largest industrial organizations.

signers have taken the responsibility of financing the forming of a special School of organizational sciences at the University of Belgrade. It had started in the first phase with an undergraduate programme, but late it was broadened to a masters and doctorate programme.

19. The consultant activity in Yugoslavia hasn't a very long tradition, but during the last few years it has become a component part of the activities of many organizations. Recently a study has been completed concerning the consultant activity in Yugoslavia and it has shown that the consultant capacities are being developed in the framework of industrial and technological institutes as well as in engineering organizations. It is estimated that already 25 - 50% of the activities of 40 surveyed research and engineering organizations have a consultancy feature in the field of technology, techno-economic studies, management etc. The survey also showed that all organizations plan a far greater broadening of their consulting activities. This process of the greater orientation of the research organizations towards the consultancy activity is natural having in mind that for their existence the institutes depend on common programmes with industry.

In spite of the positive results in the development of the consultancy activities during the past few years, Yugoslavia has been faced with the necessity of building its own concept of consulting. The former experiences in the transfer of knowledge in this field convince us of this. Another acute problem is the further professionalisation and methodological improvement in both - the organizations and the cadres. A training of consulting cadres and the intensifying of research on new methodologies and manuals should facilitate the removal of these shortcomings.

POSSIBLE ACTIVITIES OF UNIDO

20. In order to achieve real results in practice, each country should primarily work out internal measures for the active inclusion of industrial and technological research organizations and universities in the solving of long-term and operative problems in technology and management in industry. The shapes and forms of this associating should reflect the specific conditions under which the process of industrialization is being conducted.

Apart from these internal efforts and concrete measures in every country, without which the external impulses would not give significant results, it would be appropriate if UNIDO should prepare a special assistance programme for the developing countries with the aim of a more rational and effective inclusion of research and educational institutes into the process of the industrialization. Without giving detailed explanations, we would like to point out some of the activities in that field:

a) assistance in forming internal research and development centers for technology and management in the framework of modernly built large industrial enterprises. This would help to create a rational association of research and educational institutions with the programmes of innovation and the transfer of technology;

b) assistance in training and developing methodologies of consultancy services in the field of technology, management, techno-economic studies as a link between research and practice 7). This consulting institutional basis should be developed in the framework or in close interaction with industrial and technological research;

c) the training of cadres from research institutions and industry in the field of research and development and of complex research and investment projects management. This would contribute to a wider affirmation of a pragmatic approach to research projects;

d) initiating studies and the exchange of experience between developing countries concerning the measures taken for achieving narrow correlation between the transfer of technology and own research and development. It is of particular interest to support and assist the least developed countries in defining of strategy and programmes in technological development and transfer of technology.

21. "The Lima Declaration and Plan of Action on Industrial Development and Cooperation" and "The Action Programme of Economic Cooperation" adopted in Colombo define especially the activities which relate to the broadening of cooperation between developing countries in research, consulting and transfer of technology. In the framework of the realization of these conclusions, UNIDO could give assistance, amongst others - in the following:

a) active support in implementing the decisions concerning new dimensions in UNDP activities, and which are related to the broadening of the participation of consulting organizations of developing countries in international programmes, as well as broadening technical cooperation between developing countries;

b) support to the projects in which the linkage of research and technological institutes, consulting organizations, and the universities of developing countries is realized;

c) support in the form of exchanging missions and researchers from industrial and technological institutes of the developing countries, with the aim of exchanging experience, preparing joint projects, the training of cadres etc.;

d) organizing an exchange of information concerning programmes and the practice of industrial and technological institutes and consultant agencies - through UNIDO, WAITRO, etc.

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7) Yugoslavia initiated (through UNIDO) a Working Meeting of the Representatives of consultant and research organizations of the developing countries with the aim of exchanging experiences and the preparation of a special document concerning the measures for the development of consultant activities in the developing countries.

INSTEAD OF A CONCLUSION

The implementation of long-term cooperation between research organizations, universities and industry is an essential supposition for successful technological prosperity and the national and effective transfer of technology in the developing countries. The forms and attitudes to this associating has to be different, but they must correspond to the specific socio-economic environment and the conditions of each country. Although the internal efforts and measures are the basic ones, international assistance and cooperation is very valuable. In this context and in accordance with the documents adopted in Lima and Colombo, the cooperation and exchange of experience between the developing countries have a special position and significance.

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1. OECD - Reviews of National Science Policy - " YUGOSLAVIA", Paris 1976

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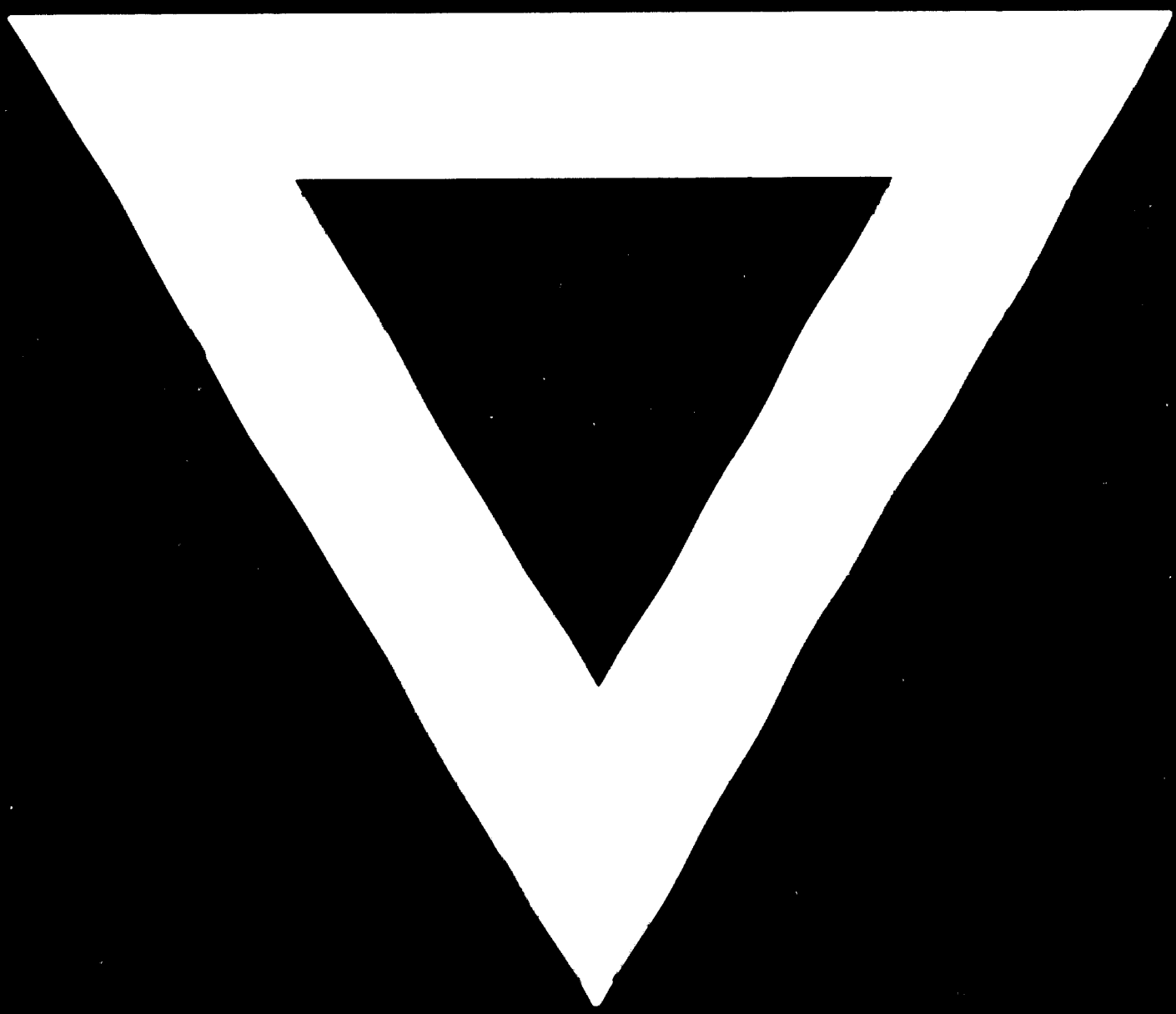

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