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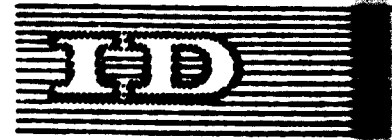
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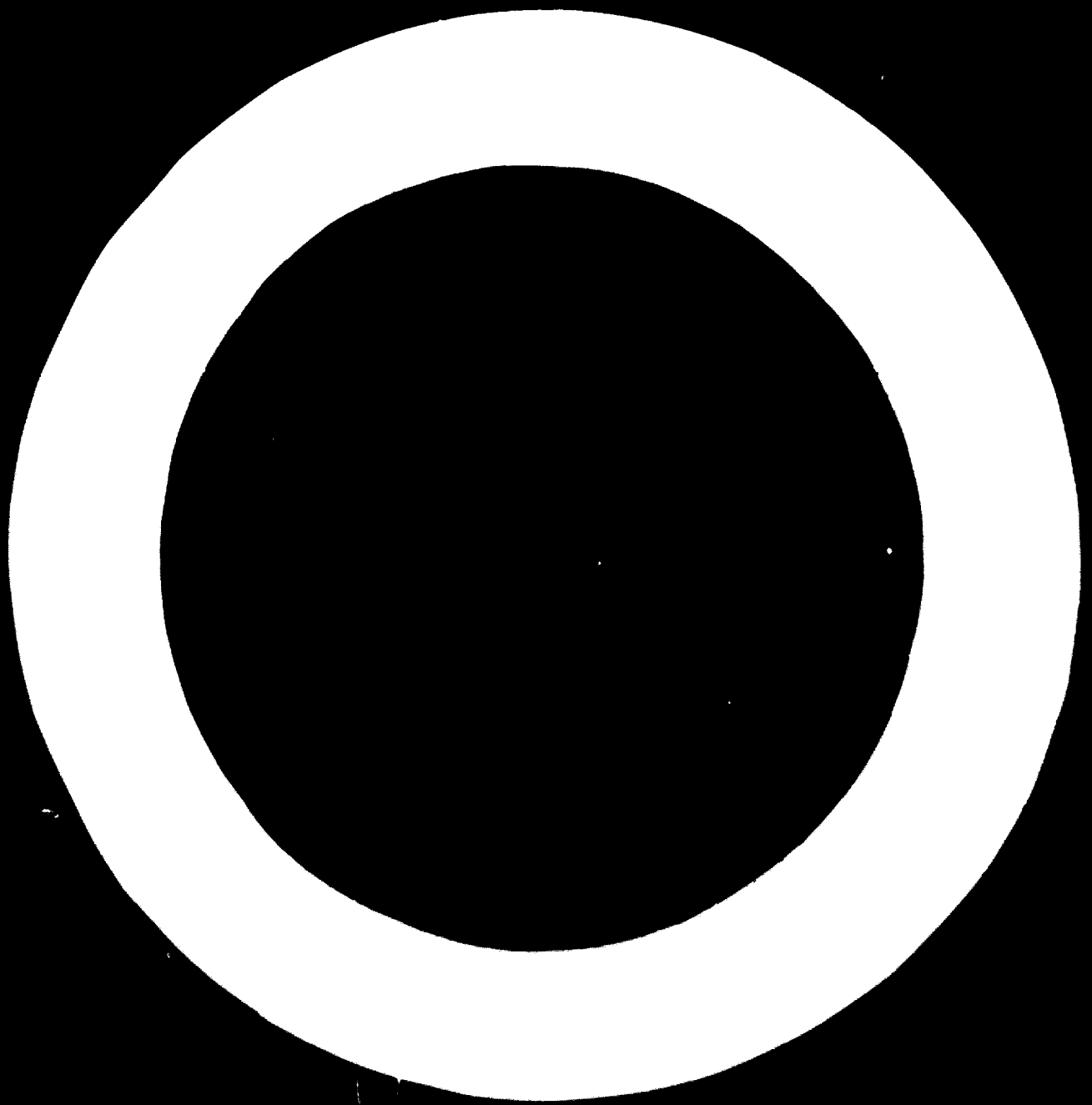
UNIVERSITY-INDUSTRY LINKAGE AND ADAPTATION TO
SOCIAL-ECONOMIC CONDITIONS ^{1/}

by

Slobodan Ristic
Yugoslav Centre
for Organization and Development
Beograd

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Introduction

The present achieved social, economic and technological development implies high interrelations between individual social sectors as important prerequisite of a successful social, material and human prosperity of each country. Although strong tendencies that certain factors in society (scientific institutions and universities, for example) for retaining a high degree of "academic independence" still exist, today more and more is accepted the statement that only in long-range cooperation adaptable to dynamic changes could the appropriate progress and rational use of available resources be insured.

A close interrelation of science and education only with government and through it a predominant ensuring of financial sources for their prosperity which is today very significant in many countries, has to be transformed. There are demands for more objective social evaluation of the results of scientific and educational institution in practice. On the other hand, that means bigger linking of these activities with users of scientific researches results, and education process.

2. There are more and more requests for a radical reform of the University system and for substantial transformation of the education process, programmes and educational methods, in order to ensure that increases in knowledge be in harmony with the specific needs of the social, economic and technological progress of individual countries. No doubt the university programmes materials and appropriate research programmes have to be designed according to the world achievement in science and technology, that means to the future. But universities must also build their educational needs of economy and other sectors (national resources, etc.). These requests refer, among other things, to more appropriate permanent education programmes and methods of mass education, interdisciplinary programmes and profiles, closer interconnection between education, research and practice, more significant social component in education, more application of modern technology in educational process, etc. It is obvious that most of the universities, traditional and by many feature bureaucratic institutes, are not able to achieve those requests and wishes of the society and users of their results. I could stress, once more, that significant and permanent changes are necessary. No doubt that the stronger position of the universities in present dynamic society ensure more stable situation in financing high education and research and enrichment of programmes and teaching material, using the experience in own industry, could be achieved only through cooperation with other factors in the society. It is clear that there is also a high level of conservatism in the other areas of society, and resistance to the role of the university in the prosperity of the country and also resistance to a closer cooperation with universities. However, this is a very broad

subject, impossible to be considered in this paper.

3. In the economic, scientific-technological and educational progress of each country, university-industry linkage could play a very significant role. This is natural if we have in mind that industry is the most propulsive part of the national economy with a very dynamic process of innovation. In most countries this sector of economy is critical in economic development. The strong position of industry and dynamic changes in technology and market requires an appropriate structure of manpower and a permanent process of upgrading and refreshment of knowledge as a prerequisite of successful domestic and international competition. Many positive examples of co-operation between university institutions and mostly large size individual enterprises exist. However, requests for further quantitative changes in the before mentioned relations are evident. Industry demands a more significant influence on programmes and methods of education and also that domestic experience together with international knowledge and experience has to be a basis for the content of the education process. Finally, there is an express request for qualitative involvement of universities in system of permanent education of managers and specialists from the practice. Very dynamic technological and market changes in industry imply such an orientation of universities.

4. Management education as a very important factor in increasing the efficiency and rationalization in many countries has not progressed satisfactorily. In many cases the mechanical unadapted transfer of the forms, programmes and methods of education to the local situation from more advanced countries, especially from the USA, is one of the most significant reasons for lagging behind. If we agree that management is a social process, I think there is no dilemma today, then the system, programmes, methods and content of education in this field has to be highly adapted to the socio-economic condition and situation in individual countries. Transfer of know-how from the most advanced countries is very important for acceleration of development, but gradual introduction of the own concept, programmes and cases from domestic practice is a prerequisite that education, regular and upgrading, adapts to the real needs and conditions of industry and other social and economic sectors of the country. Higher involvement of one's own practice and experience in education - regular and upgrading, in the field of management does not mean decreasing of education level. On the contrary, the application of modern methods and techniques and their adaptation to the specific socio-economic conditions provides the opportunity for achieving an appropriate theoretical level and at the same time practical results. Educational institutions have to find the forms and ways for a qualitative involvement in this process. Finally, universities should contribute more to the upgrading programmes for managers and

specialists. This task is, according to many of its characteristics, a very responsible one. Specialists from practice ask for quality, that is, they are not satisfied only with "academic presentations" but they wish to combine theory with practice.

All developing countries form their universities with the intention of accelerating through creation of the high qualified personnel base, their economic and technological progress and by that social prosperity. However, low level and material potentials, undeveloped own applied research lack of teaching staff and other problems, represent high constrains of the process in economic and social transformation. Under these conditions, university-industry relations and cooperation are faced with many problems. The universities are almost exclusively financed by the Government. Real conditions and motivations for necessary adaptation to local socio-economic conditions of the programme contents and methods of education do not exist, industry does not have, in most cases, its own research capacity, etc. All this reflects on the university-industry linkage and interrelations - this cooperation is in most of developing countries are more Platonic, that means material and other assumptions do not exist enough. This subject deserves to be particularly considered in the process of industrialisation of each country. The stimulative measures for improving the university-industry linkage are an important factor in the development of each individual country.

After these general considerations further discussions will relate to experience in the Yugoslav practice - general conditions and concrete examples of the successful implementation of the university-industry cooperation. The management area in Yugoslav practice is of special interest, because it is developing under specific socio-economic conditions. This implies a specific request in education and practice in management. Although the peculiarity of each country determines the ways of development of universities and their linking with industries, some experiences of Yugoslavia could be useful for other developing countries.

University-industry Cooperation in Yugoslavia

In the post-war development Yugoslav industry has had a very dynamic economic development. Significant growth of industry (average rates for industry 1947-1967 was 9,6%) has implied structural changes in Yugoslav economy - participation of industry in national income in 1947 was 28,8% and in 1967 was 48,7%. Industry has become the dominant factor in further Yugoslav economic progress and expansion at world market. At the same time through the expansion of higher education and with the founding of new universities, new cadres for the economic and public sectors have been created.

Changes in the socio-economic system have been laid for a more close relationship between industry and university. One of the very important forms of cooperation and

coordination in Yugoslav socio-economic system the self-management agreement. This is one of the basic institutions of the Yugoslav self-management system which enables and stimulates the integration of goals, interests, programmes and activities among different parties in Yugoslav society. The self-management agreement has become more and more a very important framework for establishment of a long-range cooperation between universities and industry, universities and research organizations, etc. This form of cooperation is relatively new but the first results show as that the foundation will be laid for radical changes in the relationship between education and the economy and between science and economy, etc. A reliable indicator is, no doubt, the changes in the sources for financing of universities. After the period when almost total university activities were financed by the Government one survey indicated that in 1968 Government's contribution (mostly Federal and Republican funds) were ca. 83%, in 1969 were 88% and in 1971 75%. Some of the examples could illustrate tendencies in cooperation university-industry.

9. School of Economics University of Belgrade and Belgrade Chamber of Economy signed in 1971 a long term agreement for cooperation with the main objectives of improving education and training in the field of economic sciences for the need of industrial and other enterprises in Belgrade. The basic forms of cooperation are:

- Upgrading courses for innovation of knowledge for specialists from the practice
- Organization and implementation of master programmes specializations for the specialists from enterprises
- Cooperation in improvement of educational programmes and methods at the School of Economics
- Joint selection of the themes for the master and doctoral thesis
- Cooperation in organizing summer practice for regular students
- Research projects for the needs of the economy of Belgrade.

Within the framework of this basic agreement the School of Economics has signed several additional agreements with large enterprises in the Belgrade area. The first results of those agreements are evident. The School of Economics ensures 33% of its financial resources on the basis of cooperation with the Belgrade Chamber of Economy and individual enterprises. This gives an opportunity for improvement of the education process and on increased research programme.

10. Some relatively new universities and schools demonstrate broad activities in finding a long term relation with industry in order for further expansion. A few examples will illustrate this:

- School of Electrical Engineering at University of Sarajevo has for many years

a very close cooperation with one of the largest Yugoslav enterprises in the Electrical Engineering area "Energoinvest", Sarajevo. The long term cooperation involves: financial support for buildings and equipment using enterprises' laboratories and computer centre for education purposes, cooperation in implementation of graduate programmes, etc. Most of the students join "Energoinvest" after finishing university.

- The same School of Electrical Engineering recently signed a self-management agreement with electrical utility enterprises (power plants and distributions) in the Bosnia and Hercegovina for long term cooperation and financial support of education programme if the interest for this group of industries. This involves support in equipment and implementation of education programme at School of Electrical Engineering.

- In Zenica, the largest metallurgical industry centre in Yugoslavia, there has existed for many years a very successful and progressive link between the Metallurgical Combine, Metallurgical Research Institute and the School of Metallurgy. This long range cooperation has produced very positive results for the group as a whole. The Combine is growing very rapidly, the Research Institute is one of the best in Europe and the School is one of the best in Yugoslavia.

11. The same results have been achieved in cooperation between university and industry in the field of research and development. A survey in 1971 ^{1/} shows that the number of research contracts between university-industrial organizations increased in 1969 to 570 compared with 308 in 1968. The value of contracts increased by 70%. The biggest constraints for university-industry link in RandD is insufficient research capacities at universities. Namely, in the first period of industrialization in Yugoslavia independent research organizations were established and most of the research has been carried out by those organizations. Positive tendencies in the last period of time are in integration of the independent institutes with large industrial enterprises or universities. Those processes will reflect positively on university-industry link.

Management Training and Education

12. The application of modern management methods and techniques does not have a long tradition in Yugoslavia. The UN Development programme, through UNIDO as the executive agency, has supported since 1971 the establishment and three years of operation of the Yugoslav Centre for Organization and Development. The Centre itself is an integrated research, consulting and training institution, multidisciplinary from the programme point of view, which integrates 18 institutes and consulting organizations of

^{1/} The survey involved 95 mostly large industrial enterprises.

different profiles. The Project is oriented towards the transfer of know-how through practical work at the same time preparation of the Centre for management training activities. Management education is mostly traditional from the programme and teaching methods point of view. The request from the users for changes has had a positive influence on the gradual improvement of quality of education. In the area of management several examples of a successful industry-university cooperation could be mentioned.

13. 250 enterprises mostly in Republic of Serbia and Banks agreed, two years ago, to form an association for the support of education in organization sciences. They financed the establishment of a special school of Organization Sciences at the University of Belgrade, which started with an undergraduate programme last year. Most of the students are from the practice. The next step, now under consideration, will be the support of some research programmes leading to the improvement of teaching methods, developing case studies from the Yugoslav practice, etc.

14. For the promotion of practical application of modern management methods the link between consulting organizations and university could be very useful. Yugoslav Centre for Organization and Development, Centre for Graduate Multidisciplinary Studies, School of Economics and School of Mechanical Engineering University of Belgrade, signed in 1972 a long range agreement with the aim of improving the graduates programmes and carrying out of joint research and training. Research and consulting work of the Centre represents a basis for preparing case studies and other material for education process.

15. The peculiarity of the Yugoslav socio-economic systems, based on broad involvement of the workers and employees generally in the decision making process has to have strong influences on programmes and methods in management education. More cases and materials from the Yugoslav practice should find their place in education. This is specially important in the area of organizational structure, management development, decision-making process and procedures, management information system, etc. On the other hand the education has to have mass characteristics, that means to be approachable for the workers and employees with different backgrounds and levels of education. Using the mass media for education could be the best way for achieving this objective. Development of programmes and methods of education of people involved in decision making is one of the basic prerequisites for further democratization and efficiency in Yugoslav economy. This long range task is under consideration and research. Industry-university research and consulting organizations link has to be a framework for this very delicate and responsible activity.

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