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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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CO-OPERATION BETWEEN INDUSTRY, RESEARCH INSTITUTES, UNIVERSITIES AND UNIDO WITH REFERENCE TO THE EXPERIENCE OF THE INSTITUTE FOR INSTRUMENT DESIGN IN BULGARIA 1/

by

Konstantin Popov*

* Research Institute for Instrument Design, Bulgaria

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The rapid implementation of the scientific and technical achievements in view of the increase of the efficiency of labour is one of the main purposes of the economic development of the Peoples' Republic of Bulgaria.

In order to achieve it, the following measures had to be taken:

1. Specialisation and concentration of production, improving its structure and new technologies implementation.

2. Strengthening of the intensive factors, speeding-up and increase of research efficiency. Improving the technical and economic characteristic features of the production process through automation of the main industrial branches in correspondence with the National Programme for implementation of automated process control systems and computers.

In order to get these results, it was envisaged that 35 per cent of the capital investments are to be used for implementation of new technologies, for modernization and automation of the production processes.

In the period of 1971-1975 the Government went on with the policy of speeded-up industrialisation, the industrial production portion being 85 per cent of the total production of the country.

Priority was given and will be given to the development of the machine building, power generation, metallurgy and chemical industry. The efforts for automation of the production processes and use of instrumentation will be concentrated mainly in the above mentioned industries. The increase of the production of the country had to be achieved mainly through increased efficiency of labour, which on its turn could be achieved through implementation of modern automation and mechanisation. And in order to do all those things, a great number of devices and means of automation were necessary and had to be produced in the instrumentation plants in the country. On the other hand, the implementation of modern devices in the industry requires research and development work to be done quite ahead the beginning of the production.

Bearing this in mind, the Bulgarian Government established the Institute for Instrument Design in 1966 and being aware of the importance of this act, it asked the United Nations Organisation for technical assistance from the United Nations Development Programme.

The objectives of the Institute for Instrument Design are as follows:

- Development of devices and means of automation
- Working out a prototype and technical documentation, necessary for organisation of production
- Carrying out of pilot production
- Implementation of the devices developed into production
- Assistance to production expressed in technology for increase of productivity and quality control
- Manufacturing of devices and tools necessary for production
- Testing of devices and instruments produced, reliability testing
- Training of the production personnel of the plants. Improvement of their qualifications
- Study of the future needs of the country and technical and economic research
- Study of the need for purchasing of licences and know-how for some devices.

Naturally, bearing in mind the fact, that Bulgaria is a small country, it was not possible for the Institute for Instrument Design to spread out in all fields of instrumentation. The main efforts of the Institute were concentrated in the following fields:

- Digital measuring instruments for voltage, current, resistance, frequency, temperature, pH, flow, etc.
- Laboratory and industrial stabilized power supplies including reference voltage sources and programmable power supplies
- Numerical control for machine tools

- Devices and means for process control: electrical, electronic and pneumatic

- Hybrid computers and application of mini and micro processors

- Gas Chromatographs.

The Institute is within the framework of the State Economic Association 'Instrumentation and Automation' and it determines the technical policy of 24 production plants within the same Association. Since a great number of the plants were new ones, the main purpose of the Institute was to develop initially as many devices as possible in order to give possibility to these plants to produce something. But it became clear that not only the development process is the important one. The process of implementation has a great importance as well and the quantity and quality of the product manufactured depends on the correct implementation and training of the production personnel. The technical staff of the Institute grew out quickly in the process of development and for this not only the difficulties that had to be overcome in the process of development contributed, but also the contacts with specialists from other fields, the international contacts, the information got from periodicals and publications, the visits to international events, exhibitions, symposia, etc.

One has to confess that the technical staff of the Institute grew out more quickly than the technical staff in the production plants. This is the cause for slowing down the rate of development in the Institute and for paying serious attention to the process of implementation and the final result was that a great number of the technical staff of the Institute went into the plants. These people organised the production, adjusted the devices and made the final tests. And since a new production range had to be created for the plants, we had to find out new ways and reserves. That is why we established contacts with the universities, which on the basis of research done at the Institute, developed devices to the stage of prototypes. And since this form of co-operation was based upon contracts, a possibility was created for a number of theoretically well prepared people to get interested in development which led to prototypes. These prototypes were taken back by the Institute's personnel in order to get adapted for plant production according to the conditions of the specific plant. This is a result only of the fact, that the University specialists no matter how well theoretically prepared, often do not know the production possibilities of the plant, where the device developed by them is to be produced.

The personnel working at the Institute is divided in departments and the different departments are responsible for and do development work for specific plants. In this way the personnel live with the problems of the plants, for which they are responsible and know their production abilities well.

The growth of the specialists from the Institute is directly connected with the number of developments implemented by them. The hierarchy growth of the university specialists was initially connected mainly with the number and quality of their publications.

When it became necessary for them to contribute to the industry, it was considered initially, that a material interest, i.e. additional payment given on the basis of the contracts concluded with industry, would be sufficient to make them do such kind of work. It occured, however, that this is not enough and it became necessary on a state scale to change the requirements for attaining of academic rank, i.e. except number and quality of publications, it is also necessary to have developments implemented in production.

Besides the research and development activities, the Institute also does studies and technical and economic developments, which are the basis for determining the future activities in the field of instrumentation. In this way, by giving proposals to the higher authorities for including of new problems in the development plan, the Institute for Instrument Design determines indirectly the technical policy of the country in the field of instrument design.

After the assessment of the expediency of the proposals made, the higher authorities include or not the problem proposed in the plan of the Institute, where the type of work, the terms for finishing of the development and the expenditures necessary for it are done on the basis of contract. The Institute also includes in its plan other tasks when their technical and economic expedience is justified on the basis with contracts with production plants.

The Institute for Instrument Design tried to find out other possibilities for developing of instruments by other institutes with similar activities abroad. It was aimed to speed up the solution of some basic problems by means of international collaboration. It occured, however, that this way is not a very easy one. Usually those organisations were not well aware of the specific problems in the country and as a rule, the solution of those problems was one-sided. The approach for search of a specialist from abroad, who had to accept to solve the problem after coming into the country for a longer period, was also

found out to be not quite successful. Too much time was necessary for the specialist to get acquainted with the conditions in the country.

It was much more expedient to solve problems in the following way: the specialists from the Institute would get well acquainted with the problem and after that for a certain period of time an international expert on this problem would be invited for consultation and discussion with our specialists. All this requires, however, finding of a prominent specialist in a suitable period of time, and sometimes this is not possible, especially on international basis.

Another way to use the foreign experience was the purchasing of licences and know-how. In this way the problem of numerical control for machine tools has been solved. The receiving of new development through licence gives the possibility to change the technical level of this field with a jump. Here, however, appears another difficulty, which is especially manifested in the complex devices and which is as follows: normally these devices are realized with a great number of components, which the country - licenser has chosen according to the conditions there. But in order to be economically independent as well as to get profit, it is necessary for the licensee to change the components according to the conditions in the country. Sometimes this is a long and painful process.

One more expedient form of collaboration is the co-operation both in the development and production fields. In this form of collaboration, the device proposed for development is divided in assemblies with determined input/output parameters. Each country dies both the development and the production of some of the assemblies and the meeting of needs for this device in both countries is done on the basis of contract.

We can accept, on the basis of our 10 years experience and not without UNIDO assistance, that the right way of co-operation between research institute and industry has been guessed. It is risky, however, to say that this is the only right way. This depends mainly on the conditions existing in a certain country, the extent of development of its industry, the level of the technical personnel and other factors which can be specific for any special case.

However, the experience we have already got, gives us the liverty to propose our services in the following fields:

- Consultations in development of digital measuring devices, power supplies, gas chromatographs, devices for process control, numerical control for machine tools, use of microporcessors in instrumentation

- Reliability testing

- Organizing of research and development institutes with training possibilities

- Accepting fellows for short and longer periods of time
- Organizing of testing laboratories and providing equipment for them.

As far as UNIDO is concerned, its part should be mainly co-ordination and management activities in the following directions:

- Organizing of symposia and seminars on specific problems with the participation of prominent specialists on these problems

- Directing the developing countries to the organizations which could assist them in the solution of problems in the organizing of research, development and implementation activities

- Assisting in the solution of difficult problems by consultations or organizing of training groups

- Equipping of universities with some devices and instruments in order to give them possibility to do research work

- Publishing of information manuals for the research work done with the UNIDO assistance.

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche

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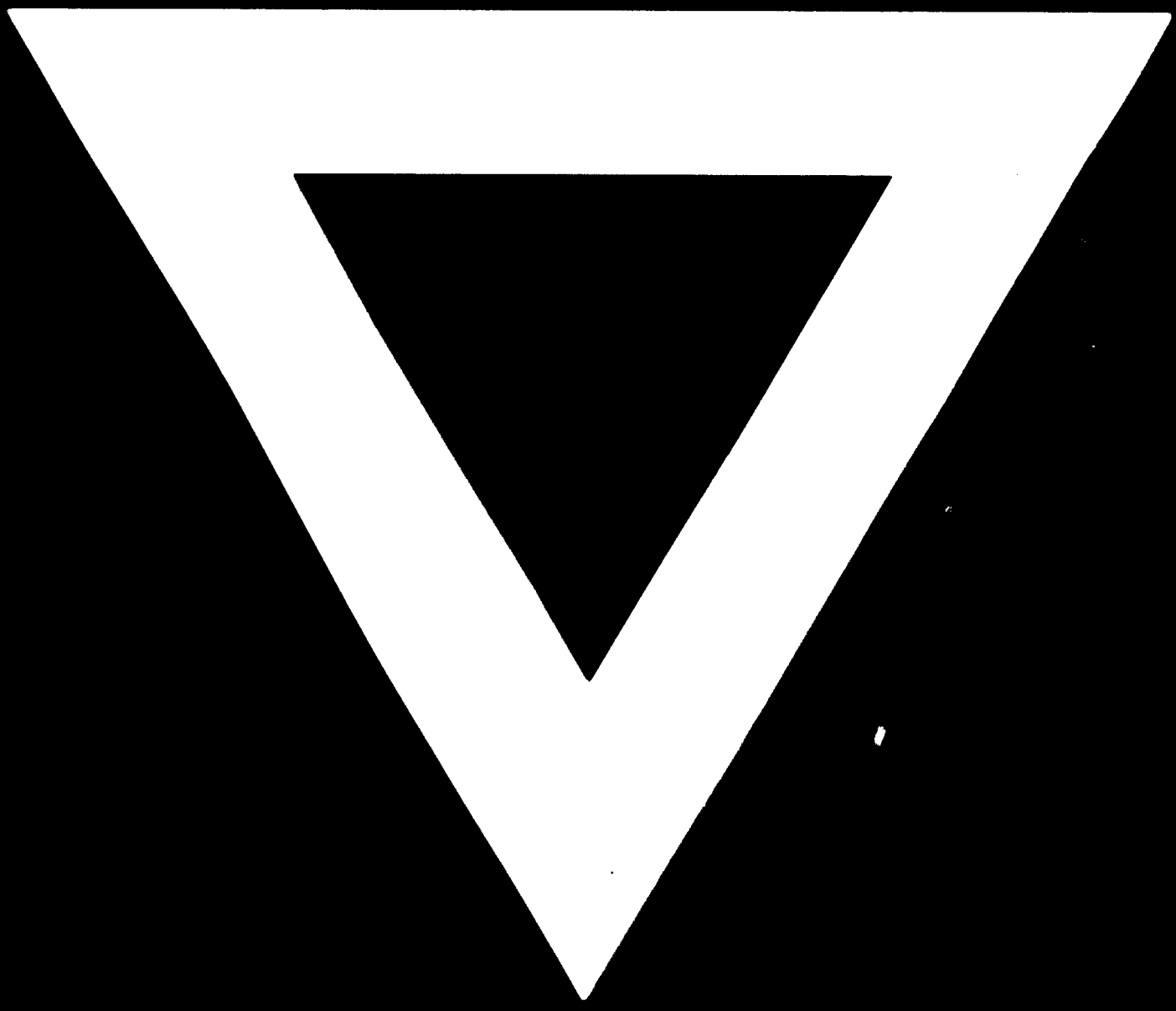

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