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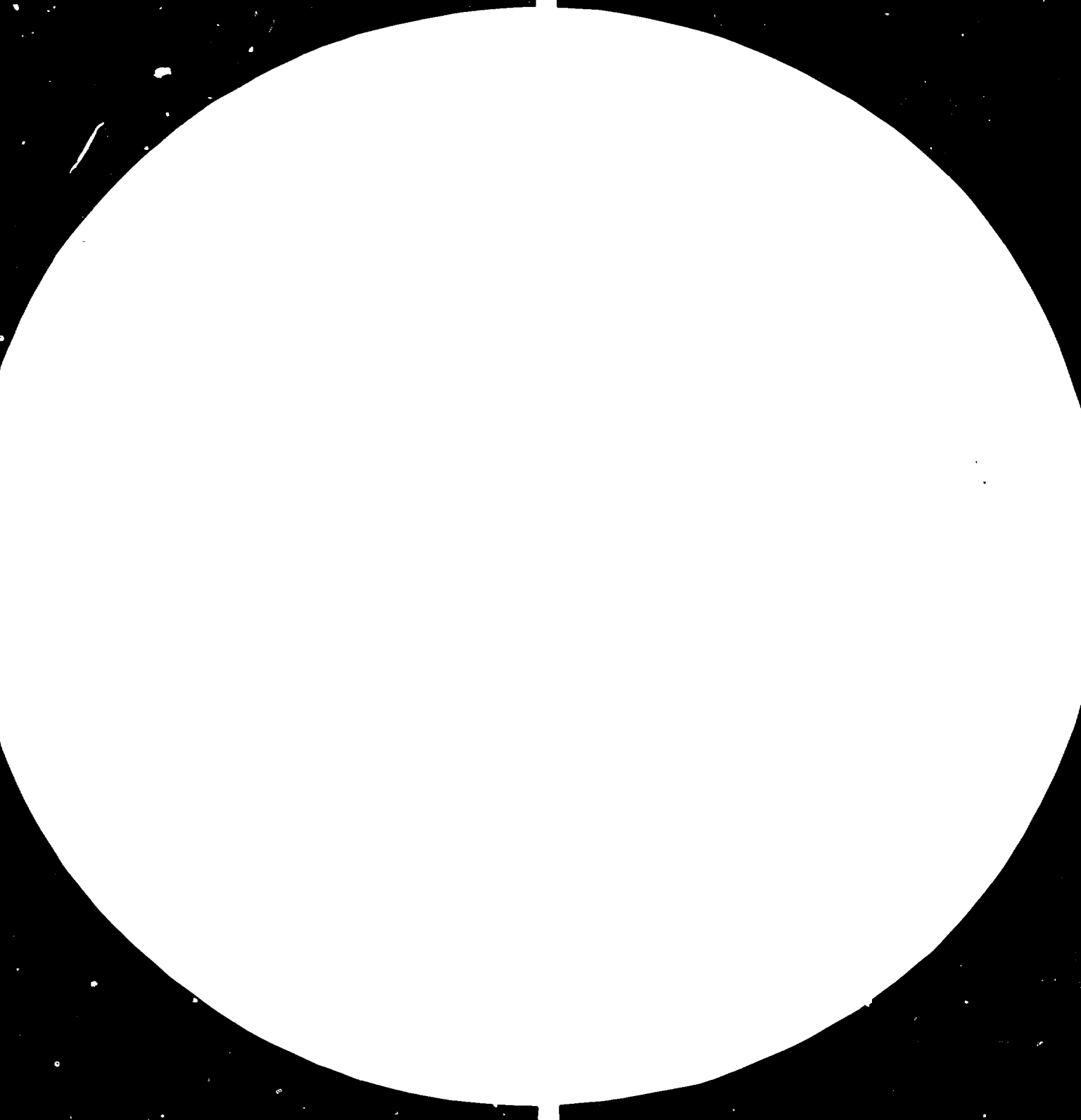
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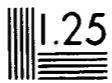
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UNDP/UNIDO STAFF WORKSHOP

on

INDUSTRIAL RESEARCH AND SERVICE INSTITUTES

2 - 4 June 1980, Vienna

Role of IRSIs in National Strategies for  
Industrialization, Science and Technology Development \*

(A summary of the Theme I discussions)

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I. Introductory Remarks by the Chairman - H.W. Tanaka, Acting Head, Development and Transfer of Technology Section, International Centre for Industrial Studies, UNIDO

The objective of this workshop is to focus on those specific subjects emerging from the joint UNDP/UNIDO evaluation of IRSIs which are considered to be of most relevance and interest to UNDP and UNIDO staff in planning and implementing projects of technical assistance and co-operation with IRSIs. The subject of Panel I is the "role of IRSIs in national strategies for industrialization, science and technology Development."

What has the joint study revealed? What has come out of the whole study is one thing and to make use of the findings for our future activities is another thing. This second matter is what we are trying to identify. In other words, how can we effectively apply the contents of the study to our future work for the benefit of the recipient countries? It is trying to translate the findings into practical actions for our future benefit. The subject of the role of IRSIs can be, for instance, related to the place of IRSIs within the national institutional infrastructure for industrial development in general and, in particular, among institutions concerned with building up a national scientific and technological capability for self-reliance in science and technology: all the linkages between the IRSIs and industrial enterprises or the government offices, councils of science and technology, academic institutions, and financing institutions for industrial development; what an IRSI is and can do, the range and the functions amenable to IRSIs and institutional alternatives to IRSIs available to developing countries; the considerations involved in the decision to set up an IRSI and define its functions; how research topics to be handled by the IRSIs fit into the national strategies and the use of an IRSI as a policy, advisory and negotiating instruments for the development of industrial technology, etc.

These are just a few of the many-folded problems and findings that have been revealed through the study and it is the objective of this panel to try to focus on the most important priority problems of these, and as a result, to get the basis for a Programme Advisory Note which could be used as a reference for our future activities.

Anyhow, I am not supposed to be talking too much about it. As we say in Japan, it's useless to try to preach to Buddha about Buddhism and I have in front of me so many excellent Buddhas in the field of IRSIs, so I would just like to take this opportunity of introducing Dr. James Blackledge. He is by qualification a metallurgical engineer and he has been the Director of the Office of International Programs of the Denver Research Institute. He is at present an independent consultant working in the field of industrial research and development based upon his very broad background and many years of experience in this field. He, as you know, was the principal consultant of the joint UNDP/UNIDO evaluation study of the IRSIs and has been kind enough to agree to take the first introductory role of the Theme No. 1 which we are to discuss in this panel. I am pleased to introduce to you Dr. James Blackledge.

II. Explanation of theme\* - Dr. James T. Blackledge, former Director of International Programs, Denver Research Institute and IRSI consultant

The whole subject of industrial research and service institutes is extremely critical, and a tremendous amount of money has been invested in IRSIs over the past twenty years. UNDP has contributed about \$55 million dollars since the beginning of UNIDO in 1967, and there were funds committed before that to support institution-building and technical assistance projects with approximately 100 IRSIs throughout the developing world. I would guess that perhaps 10 times this amount of money has been invested by government counterpart contributions, by bilateral assistance, and other sources. Since some of these institutes are more than 20 years old, and many of them more than 10, I think it's evident that the total investment in industrial research or industrial research for service institutes is quite significant. It is time to consider some important questions. Some of these have already been mentioned, but bear repeating. What has been the impact of these IRSIs on industrial development process? What have been the constraints, the impediments that have prevented IRSIs from performing in a more satisfactory manner? What have been the problems or the actions of government which have prevented the full implementation and utilization of these IRSIs? Has the government recognized its own responsibility in supporting IRSIs? I'm sure everybody is aware that you can't just create an institution, have it open its doors and then four or five years from the time of conception of the institute, turn it loose to support itself. This is a long-term process in a developing country, in fact, in any country. Twenty years is probably not really enough to achieve maturity and I think it's going to be increasingly evident that governments have to make continued commitments to the support of their industrial research and service institutes on a long-term basis. And finally, I think you can ask the question can we design or restructure these IRSIs in order to provide useful services both to government and to industry?

What we've learned in the course of the joint evaluation and other studies is that there seems to be a very vague perception about the roles of the government, industry, and other elements of the institutional infrastructure, and the development process, particularly as these relate to relationships with the IRSI. We've seen that the liaison between IRSI and government, industry, the development banks, and between IRSI and the universities or other technical institutions has been very weak. In some cases it is non-existent. Yet when we face the fact that skilled human resources are perhaps the most important commodity that can be dedicated to the application of science and technology and development, we begin to wonder why is it that there is not some co-ordinating mechanism within a developing country which causes, which encourages, which forces if necessary, these elements of the development infrastructure to work together. Of course, many IRSIs are established by their sponsoring ministries of industry but there are a few co-ordinating industrial research and development entities at the government level in

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\* Extracts are provided here. See formal paper prepared by consultant for more detailed exposition (UNIDO/EX.115, dated 27 May 1980).

developing countries. I counted about 16 a few weeks ago. In Africa, South East Asia, Europe and Latin America there are a number of councils for science and technology, but I think you'll find that most of those concentrate on science, sometimes almost to the exclusion of technology. What this means is that it's incumbent upon all of us to encourage, to advise the governments to establish co-ordinating bodies which will make it possible for the various technological institutions to work together.

I'll give you an example of what happened in Malaysia. The government decided that they wanted to establish an IRSI. At the time, there was a standards institute already in existence. There also was a rubber research institute, a food products institute, a forest research institute, a plastics research institute, and several specialized research laboratories and universities. Nonetheless, the government of Malaysia decided to establish a national institute for scientific and industrial research, NISIR, which some of you may know. NISIR's mandate and charter is very broad. There were to promote, co-ordinate, and conduct R + D, which would benefit the industrialization process in Malaysia. Immediately after they opened their doors they found themselves in conflict with the other established institutions who had vested interests in their particular areas. The net result was that NISIR was performing in a very inefficient manner. It has subsequently been reorganized and merged with the Standards Institute as the Standards and Research Institute of Malaysia, and its activities limited to a very small number of sub-sectors which are not covered by the other specialized institutes.

Let me give you an example of something that is happening in Saudi Arabia today. Saudi Arabia is really only beginning its industrialization process. They have, at the present time, a number of specialized R + D institutes. The Government recently established the Saudi Arabian Council for Science and Technology and it has as its mission to co-ordinate and monitor all R + D in the kingdom, to encourage R + D applied to industrialization through grants and contracts with existing institutions, and, to create a series of research institutes. One of these will deal with arid lands, one with the environment and natural resources, one with petroleum and chemicals, one with energy and they also contemplate industrial research and service institutes. I have to ask the question, given Saudi Arabia's scarce human resources, given the natural endowments of that country, what is it that the industrial research and service institute is going to do that is not going to be undertaken by the other existing or planned institutes? I can't give you the answer to that but I am hopeful that the Saudi Arabian government will look very carefully as they establish these institutes so that they don't waste their human resources on duplication of services.

I mentioned already some of the functions of an IRSI in the development infrastructure. This system is pretty well known. It consists of government, industry, both public and private, the development banks, the universities, the specialized institutions. I think that we have to continue to advise the government to co-ordinate all elements of this, as I said earlier, by establishing a council of science and technology or perhaps, by a ministry of science and technology, which is the case in Korea, where The Korean Institute of Science and Technology reports to the Minister of Science and Technology.

I'd like to use one institute today as a kind of a detailed case study. This is the Central American Research Institute for Industry (ICAITI). It was established in 1956 by UNDP with Special Fund assistance. It's now 23 years old.

Many people have maligned ICAITI over the years. Sometimes I think their criticisms have been correct, sometimes I think they have been incorrect. I happen to know it very well because I have been a consultant to that institute for 12 years. Let me just take a couple of minutes to tell you about the background of this institute.

It is a regional institute established by the five Central American governments. Its Board of Directors are the Ministers of Economy of those governments. Due to political difficulties, an occasional war, and the change of governments every four years, the Board of Directors of ICAITI really has contributed very little. As a matter of fact, the pledges which the Ministers of Economy make to subsidize the Institute have to be derived from the Ministers of Finance, and they don't always agree with each other. The net result has been that ICAITI's subsidy has been up and down over the years. It was pledged with a certain level, it continues today at a certain level, and represents not even 30% of the total operational income for that institute. Today ICAITI has about 100 professional staff members. They have an operating budget of 1.5 million dollars per year. As I said, 30% comes from government subsidies when they can collect them. About 60% of their support comes from contracts with governments, with international assistance organizations such as the Organization of American States, the U.S. Agency for International Development, the Inter-American Development Bank and others, and maybe as much as 10% comes from support by local industry.

Now when you look at all of Central America with something less than 20,000,000 people they have around 5,000 industries. About 3,500 are classified as small industries, 1,200 are medium-sized, and maybe as many as 500 industries on the large-scale size. Now this means that ICAITI has a very small industrial base to work with

I don't personally think, based on my own experience, that ICAITI can ever expect to materially increase its financial support from private industry. They have done very well over the years in obtaining support from the public sector and from the international assistance organizations but they're not going to receive it in the foreseeable future, in my opinion, from industry itself. And I think that's a trend that exists all over the world and perhaps it's overlooked. In the United States every research institute that I'm aware of receives about 70% of its financial support from the government sector, i.e., contracts, grants, etc.. Less than 30% in a highly-industrialized nation such as the United States comes from industry. So how can we expect a developing country institute to even hope to achieve measurable financial support for R + D from the industrial sector? Yet we go around the world telling people that all you have to do is get out and sell a little harder, be more aggressive in your promotional campaign, and industry's going to come flocking to your door. It just doesn't work that way, and I don't think it ever will. We should tell the governments this when advising them on the establishment of an IRSI. We should say to them you're going to have to support that institute for a long time. You're going to have to pay for the R + D and it may have industrial application but its not going to be paid for by the industrial sector.



The reason I want to use ICAITI as a case study is the following: ICAITI has been very active in working with development banks and in working with both the public and private sectors in a number of areas. In a ten-year period, they conducted 400 studies, market analysis, expansion, modernization, pre-investment, regional sector studies, studies on processes, production facilities, installed capacity, economic studies, geology and mining studies, and others. Of these 400 projects, 31 were undertaken for the public sector, 168 for the private sector, 60 for development banks, 64 were conducted in other countries, and 73 for regional and international organizations. I want to be sure you understand that industry didn't necessarily pay for these 163 studies. They were paid for in part by UNDP funds, in part by international assistance funds, regional funds, etc.. They contributed to the needs of industry but they weren't paid for by industry.

ICAITI was asked by the Government of the Dominican Republic a few years ago to undertake a series of feasibility studies in that country, in four specific areas that were important to the economy: fats and oils, leather and shoes, textiles, and metal-mechanical. At that time the Dominican Republic did not have a research institute. ICAITI conducted 23 feasibility studies, of which 9 became new industries financed by the Bank. Nine of them were rejected as being either technically or economically unfeasible. Five of them, I am told, are still in process of consideration, depending on economic conditions which may prevail in the future. As a result of this activity for the Government, ICAITI was asked to design and install an IRSI in the Dominican Republic, INDOTEC. This is the only example that I am aware of in the world where one developing country has assumed the major responsibility for the design and development of an IRSI in another developing country. And I wish I could say to you today that INDOTEC is highly successful, that it's doing even as well as ICAITI. In point of fact it is not, but I don't think that's the problem of ICAITI itself.

ICAITI also maintains resident technical extension agents in each of the five countries. These are housed in the chambers of industry, they are provided with supporting service by those chambers, they contact industry on a day-to-day basis. The approach used is to provide on-the-spot problem-solving assistance if it's possible, or to refer it to the ICAITI laboratories if technical information or laboratory services are needed, or to possibly recommend some local source, a consulting firm, a university laboratory or whatever the case may be. In a two-year period since 1977, ICAITI has performed 269 projects for industry. Most of these, about 150, were merely providing technical information, but these may be the precursors to other projects that will come out at a later date. Sixty projects had to do with technical assistance principally supplied by the extension agents, and 60 projects were referred to ICAITI's laboratories for whatever services were necessary. This is not a cost-effective operation. ICAITI doesn't recover its costs for this type of activity. The thing that it does do is give them frequent, continuous contact with the industrial sector so that ICAITI at least can no longer say that they are not aware of problems of industry, that industry doesn't understand them and industry doesn't know what they are doing.

I can point out to you a similar example in Turkey. The Scientific and Technical Research Council of Turkey (TUBITEK) established an industrial liaison unit in 1960. They also use the technical extension approach. The industrial engineers who visit industry on a daily basis will solve the problem on the spot if it can be done in one or two days time. If it requires more time or requires laboratory experimentation, they will refer that project to a university professor, to an R + D institute, or to one of their own TUBITEK specialized institutes. They refer their information needs to the National Documentation Center. The latest data I have on them is 1975. During that year they solved 500 industrial problems through this mechanism of technical extension and industrial liaison. I don't know what the number is today. I presume that it's at least that much and perhaps more.

The point I'm getting at is that one of the things that the IRISI has to do is to maintain industrial liaison on a frequent, continuous basis. It isn't sufficient to send an expert into a country and expect him in two weeks or three weeks time to gain much more than a general overview of what industry is all about. If he visits a plant, of course the man will tell him that his problems are principally financial, and he probably will also tell him that he would be glad to support R + D as long as he doesn't have to provide some money right at that moment to pay for it. There's no substitute for the type of liaison between the institute and the industry that I've been talking about in the case of ICAITI and TUBITEK. They have to go out on a daily basis. The IRISI staff have to be involved. They have to understand fully the problems of industry, and also recognize that probably they're not going to get very much support for R + D at least initially, but they will get support for technical-economic studies and for basic services. A number of years ago WAITRO conducted a survey of all of its member institutes and asked the question, what are your problems? What tends to inhibit your interactions with industry? The number one priority item of the then 95 members of WAITRO was lack of knowledge of industry's needs and lack of staff with industry experience. I conducted a similar survey a little earlier with 17 IRSIs in Latin America and South East Asia and asked what are the constraints that inhibits your ability to be effective contributors to industrialization? They made the same point. We don't know industry's needs or we don't have industrial experience. They don't know us and so we have a gap in our communication process. I think this is something that has to be emphasized more and more as time goes on, i.e., the necessity for these institutes to go out and learn what industry wants, what industry needs, even if the government pays for it.

I'd like to conclude with some remarks about transfer of technology. We all think, we all say, that IRSIs should be involved in the technology transfer process. I think they should be myself. It's a very difficult process to be involved in and it's fair to say that our evaluation study showed that very few of the IRSIs were involved in this transfer of technology process. Partly, again, due to lack of awareness of industrial needs and partly because they were attempting to transfer technology that's not appropriate to the existing needs, to the available raw materials, the labor base, etc.. Obviously, you've got to have a need and a user. An example of a transfer experience concerns the Institute of Technological Research (IPT) in São Paulo. IPT has a linkage with the Denver Research Institute, has had for a number of years.

During the early days of the space age, the U.S. space program developed a technology for explosively forming of metals using, not dynamite, but more sophisticated explosives to form and shape sophisticated parts for their launching program. Most of this work was developed by U.S. contractors; the Martin-Marietta Company, the Denver Research Institute, among others, were involved in it. We felt that this technology would be appropriate for use in Brazil. Brazil has a very rapidly-growing chemical industry, needs a lot of stainless steel. They produce very little stainless steel in Brazil, particularly in thick sheet gages, and they have no equipment for roll bonding, or cladding, of thin sheets of stainless to thick sheets of mild steel for corrosion resistance purposes. Our idea was perhaps explosive cladding of say 3 or 4 millimeter sheets of stainless to 20 millimeter sheets of mild steel would provide the corrosion resistance and the thickness of the plate, would provide the construction rigidity for use in the chemical industry. We surveyed the Brazilian industry. We found there was a potential market. DRI trained the IPT staff. We transferred the technology to Brazil. We helped them to develop the facility. They went into production and today they are producing two by three meter plates, clad with approximately 3 mm. of stainless on about 16-20 mm. of mild steel. It's done routinely. They're also using the same process to explosively swage the condenser tubes into the tube headers for applications in the boiler industry.

I think the reason that this transfer took place is because of the twinning arrangement, the linkage between DRI and IPT. We had the technology in the United States, they had a need, and I feel very strongly that if an IRSI is to transfer technology, the best mechanism that can be followed is that IRSI have a linkage with an institute in another country. It doesn't necessarily have to be at an advanced level, but it certainly needs to be an institute that has some knowledge of the technology and understanding of how to apply it.

I'd like to make just one comment about alternatives, because a lot of people are questioning nowadays whether or not there should be IRSIs. There are a lot of resources in a country. The universities have scientists and engineers. Consulting organizations have people who can perform certain tasks. Productivity centers can perform certain types of services. Occasionally you'll find analytical chemistry, quality control or testing laboratories. Sometimes they're private, sometimes they're public. I think the governments need to look at all of these as they contemplate designing or creating an IRSI and ask what have I got available today, what have I got that I can use in the short-term, namely the first five years? Maybe it's a combination of consulting firms, analytical laboratories and universities. Then they have to think in terms of the medium-term and the long-term. They have to appreciate the fact that they do have a lot of resources there which very likely are not being used in an effective manner.

Well, I think the sum and substance of all this is that although many governments are not going to change their methods of operation, we as advisors have to begin to explain to them the need for co-ordination of all elements of their development infrastructure. We have to advise and council them on ways in which these institutes can function. We have to advise them that it's not a short-term undertaking; it's a long

involvement, including financial and moral support. And of course we have to begin to train the people in the IRSIs to learn to function and interact with industry and with the other elements of the infrastructure as well.

### III. Panel Discussion\*

The first speaker pointed out that, among other purposes, the personnel of IRSIs are a valuable source for supplying new industries. In the case of Sudan, for example, the Industrial Research Institute was the only source the government could draw upon to operate or manage a number of public sector industries being established. In his experience, it has been more effective for IRSIs to be attached to industrial ministries than ministries or councils of science and technology.

In setting an IRSI into the total development picture, another speaker suggested that there are five categories of technical competence that developing countries might want or a need to achieve and that these really are quite different needs and very different functions. The first was described as the need for the developing country to obtain competent operators, and this would involve basically skills training. The second would have to be competent production engineers capable of keeping the machines running. This again is entirely different requiring different knowledge and skills. Third is the need for maintenance engineers in order to repair and restart machines which have suffered breakdowns, and again this is a different skill. Fourth is the need for design engineers who have knowledge of production processes and would in fact be able to design new production processes. This is where a different phase of development starts. Fifth, a country needs to achieve plant-building capacity which runs along two streams: one, the ability to produce capital goods; two, the ability to construct large plants on schedule. It was suggested that these five needs are, in effect, categories of technical assistance needed by developing countries in different stages of development. The speaker also suggested that if an IRSI was being conceived as a apex institution, embracing all these needs, that they would be in for troubled times. In a similar context, the panel member did not understand what an IRSI could do in formulating national strategies for industrialization which to him are basically economic functions, although they would of course have some role in its implementation. Another speaker claimed that the title of the theme implies the presence of a national strategy, whereas in fact they often do not exist or present an optimistic appraisal of development opportunities in the industrial sectors without taking into adequate account either the availability of resources, capital or otherwise, skilled personnel, infrastructure, energy, etc. In such conditions, the tendency to transfer what was successful in one environment to a different environment needs to be resisted. It is critical at the project design stage to ask ourselves how we can adapt IRSIs to national

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\* Those portions of the panel discussions most relevant to the theme are summarized herein. Panel participants included: A.K. Basak, IOD/COOP; L.F. Biritz, IOD/FCTY; M. El-Halfawy, IOD; C-H. La Munière, BPPE/UNDP; and N. Ramm-Ericson, ICIS/REG.

strategies if they exist or, if they don't, to the realities of the industrial sector. In such a design, it is also important to recognize the long institution-building period required before IRSIs can make effective contributions. Instead of piling unrealistic objectives into a project document, it should be recognized that different development stakes are involved requiring phased institutional growth and in recognition that conditions will be constantly changing. Finally, in performing such a project design, the panel member thought it was important to send national staff to visit successful institutions so that they will be fully aware of the tremendous difficulty which will face civil servants trying to operate an IRSI.

Another speaker suggested that the theme has two connotations: one having to do with the role that IRSIs have to play in the implementation of government strategies for industrial development; and the second is the IRSIs role in the actual development of such strategies. In the latter, one is talking about government-IRSI relationships rather than IRSI-industry relationships. What can the IRSIs do to help governments develop effective long-range strategies and plans for scientific, technological, and industrial development? The first question is what specific areas can an IRSI be useful? Certainly one area concerns raw material utilization. They can also act as focal points for sectoral intelligence regarding productivity, problems weaknesses, etc., and advising the government on how to overcome them. Such a role is more important in the lesser-developed countries and conversely less important in the more developed. To play this advisory, long-range planning, and surveillance role, the IRSIs must really become centers of excellence, acknowledge in the country so their advice is sought by the government.

It was suggested that IRSIs should be in the forefront of the practical application of industrial strategies, and be pioneering in the utilization of local raw materials in the context of self-reliance. In particular, they should provide guidance in respect to the necessary linkages between the various industrial sectors, including agriculture, and they have a major role in the development of indigenous technology. At the same time such institutions should provide certain stabilizing functions, and be able to look into the longer-term future, more than industry itself which is more bound to producing immediate economic results. A very important function is the building-up of human capabilities in technology, and at the same time being able to respond to new policies or changes in strategies. This emphasizes the point that no two countries have the same requirements for their institutional system. When a country is considering the establishment or strengthening of an IRSI, the whole institutional set-up needs to be reviewed. Indeed, the successive development of the institutional infrastructure should have a definite place in five year plans or other long-term planning exercises.

#### IV. Open Discussion\*

The first speaker from the floor presented a list of questions as what governments could or should expect from IRSIs in the preparation of

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\* This is a highly-selected and truncated summary of the extensive discussion which took place between panel members and other staff members in attendance.

their national strategies for industrialization, science and technology development. It was suggested that UNDP and UNIDO enter into a joint effort to prepare schemes for securing the active participation of IRSIs in the development of national strategies, selecting about four or five countries which are receptive to the idea, and have the absorptive capacity to assist in preparing case studies on success stories which can be transferred to other developing countries. The next speaker pressed a point reiterated many times in the subsequent discussions, that is, in fact national strategies for science and technology development do not exist in most of the developing countries.

A former SIDFA stated that it is generally agreed that the evaluation exercise has been a worthwhile experience. It becomes clear that the 100 or so IRSIs supported by UNDP/UNIDO had had a very marginal impact on national development, and that their linkages with the productive sector are, at best, tenuous and the benefits derived from an enormous investment in IRSIs have been quite marginal. Nevertheless, it is clear that the results of this evaluation have to be very widely disseminated and utilized. In reading the excellent papers prepared, however, one can gain the impression that if the project document is well-designed, if the outputs are properly quantified, and if all the prerequisites are considered, the IRSI will indeed make a significant contribution. This is not really what is going to happen. UNDP/UNIDO inputs are entirely marginal and very peripheral in the whole exercise that is going on within these countries, and by virtue of the UN assistance system, staff are required to be apolitical, that is to say, keep out of politics while the whole foundation of social-economic development to which this science and development effort has to contribute is based entirely on a political transformation. So by virtue of this phenomena UN efforts become even more marginal.

In disseminating the results of the evaluation, this speaker also pointed out that R + D is only one component, one small element, in the whole spectrum of science and technology policy and planning. It begins with the development of manpower and continues through self-reliant research efforts, but is complimented by more effective capacities to choose technologies and to make them more appropriate to the rural conditions where most of the problems are. IRSIs are ineffective not merely because they have not been adequately linked with industry. The main problem is that industry itself has not been effectively linked with agriculture and its problems. IRSIs really have to focus on the problems of processing agriculture and national resources that are available in the country. The whole application of science and technology started by making agriculture a self-reliant business. Feeding the population becomes the most important activity.

Commenting on the requests received to date by the Interim Fund on Science and Technology and Development (IFSTD), it was noted that 19 projects involving around 20 million dollars are directly in the area of strengthening R + D capacity in developing countries and strengthening their linkages with productive systems. Many of the proposals are completely unsatisfactory if judged from the criteria and checklist that we have gained from this evaluation exercise and which should contribute significantly to redesigning these projects in a more effective manner.

Commenting on the repeatedly made point that IRSIs must be designed to specific conditions existing in the country of its origin, a Deputy Res. Rep. from Africa agreed, but suggested that according to regions, these institutions also have a lot in common which would provide useful guidelines to similar institutions.

A UNIDO staff member, intimately involved in the exercise, called it a "truism" that, in an ideal situation, an IRSI should be functionally directly-related to national strategies for industrialization. But the fact of the matter is that in most of the developing countries there either is no such mechanism or, if it exists, it provides little guidance for IRSI programming. Under these circumstances, what do headquarters and field staff do when trying to develop a project document which shows the intended development impact of the proposed IRSI? This is not an easy question to answer, but one that must be addressed. It involves the selection of what is called "policy objectives", the choices of which determine why the IRSI is there. Are they there to serve industry in general? Are they there to create new industry, a role they are ill-equipped to play? Are they there to serve a particular branch of industry? If they are serving a specific branch such as the textile industry, are they there for the purpose of increasing the export of textile goods, or for increasing domestic employment? There are questions that have to be answered, even if there exists no overall plan and the answers are tentative. It's part of the UN's responsibility, in giving advice to developing countries setting up these institutions, to point out to them that the most important factor in developing an IRSI is not to select the site, it is not to design the building, it is not even to send people for training or to equip laboratories, but the most important thing in the early days of the IRSI is to find out what kind of a feasible role or mission the government or other sponsors really want the IRSI to play. This may mean interacting with the sponsors at a very intimate and continuous level. If the main focus is to serve an industry that already exists, sending an expert out for two or three weeks to interview people in the industry as to what their needs are is only the barest beginning of a process of identifying these changing needs, this is the most crucial question at the beginning stages of an IRSI. What are its policy objectives going to be, what are the priorities afforded to them by its sponsors and clients, i.e., government and/or industry or both? Second, given these policy objectives and recognizing that institution-building for IRSIs is an extremely difficult and long-range process, how do you begin and nurture this growth in an incremental and sound basis with the gradual assumption of new functional responsibilities, rather than trying to do everything at once and ending up doing nothing well?

The question of whether IRSIs should serve small-scale industry entered into the discussion a number of times. The consultant commented that it is true that IRSIs generally ignore this sector for two reasons. First, the level of technical training of IRSI staff is generally such that they are motivated to perform sophisticated R + D and, second, the kind of help that these small industries need in their emerging stage is more in terms of industrial engineering than R + D. They need problem-solving, process optimization, how to generate better castings in their cast-iron factories, etc. A Ph. D in chemistry, or physics, or even engineering is not going to be the right kind of a person to do that. Also the small industries don't have the money to pay for such services, although some countries have solved this problem by establishing a

revolving fund in which the IRSI can draw for providing such services. Even so, one will not find many IRSIs preoccupied with the problems of small scale industry until you get the right combination of staff with interest and experience in that area, as well as the funding mechanism to pay for the services. This means that IRSIs should have as part of their table of organization, technical extension agents, people who are trained as industrial engineers, who have experienced these kinds or types of problems, who can help the man on-the-spot with his problem and which may make a tremendous difference to his operation. One must also remember that small industries sometimes become larger industries, and therefore there is a potential market if the environment is positive.

Commenting on the question of how much money to invest in R + D, it was suggested that some industries are more R + D-dependent, e.g., the computer industry, than more conventional industries like iron and steel. It is a mistake to use an IRSI, defined as an institution with a major R + D component, to take on jobs which are quantifiably impossible for it to handle, and not desirable in terms of effective use of its scarce talents. For example, an IRSI cannot take the place of an educational institution, nor can it be the main instrument of industrialization.

The UNDP co-ordinator of the joint evaluation exercise made a number of points beginning with the proposition that the basic problem with IRSIs appears to be (a) a lack of purpose clarity, and (b) viewing them generally as a panacea rather than one element in the necessary industrial infrastructure for development. Referring to a statement in the report of the high-level review group, that "An IRSI, as defined in the evaluation report, may or may not be the model suitable for every country.", he suggested that this statement was very significant, not only from the standpoint that an IRSI has to be country-based, but as to whether it is the proper institution at a particular stage of a country's development, given other alternatives. This same group put a tremendous amount of emphasis on the conclusion that before establishing IRSIs, developing countries need to consider the infrastructure prerequisites for the use and application of what are loosely referred to as subjects of science and technology.

He took issue with the suggestion that multi-branch IRSIs might be more amenable for the less-developed countries, pointing out that an IRSI is a very sophisticated institution and that if it has a role anywhere, it is in the more developed countries, and that the LDCs can neither afford nor have the capability of establishing one. Therefore, perhaps the first question is why an IRSI at all. And assuming that the answer is positive, will this institution pull development, will it initiate action so that industrial development will occur more rapidly in the country? Or on the other hand, is an IRSI merely an institution that follows the general life and development of a country? There are many people, particularly politicians and diplomats, who view institutions such as IRSIs as pullers of development, and that is why there are so desired, because they are seen as instruments that are going to bring about rapid industrial development and technological self-reliance. But is that really the case?



Referring to the comments that the needs of each developing country are different, he raised the question as to the value of UNDP/agency thematic evaluations such as this one. Thematic evaluations generalize across the world. If one has to address the needs of a country specifically, does a thematic evaluation really provide useful information that is going to be particular to that one country we are trying to serve? What is the use of checklists or other mechanisms that tend to generalize experience on a global basis if we have to address particular country equations which may vary and be totally different because of political structures, development phases, etc? In his opinion, the IRSI evaluation study merits reading not so much because it will provide all the answers or checklists, but because it will serve to open the mind and perhaps initiate a dialogue in addressing the needs for particular countries.

An IRSI itself is an empty shell without its human resources. The question is the capability of technical and scientific people to operate in a particular social milieu. You can establish buildings and walls and throw a few toys inside, but unless you have people, professionals of a certain calibre and standard, it is useless for these institutions to operate and to give paths which the individuals and professionals within those walls are incapable of performing.

One of the major difficulties facing UNIDO and UNDP in trying to serve developing countries, is that they do not show a commensurate or equal clarity of purpose when they approach the UN to help them in the establishment of so-called IRSIs. On the other hand, as organizations, UNDP and UNIDO do not seem to have the backbone to challenge them and show the potential sponsors and investors that they are asking for something that has no answer.

There was considerable additional debate as to the justification for IRSIs in the lesser-developed countries, reflecting to some extent the confusion in the minds of some participants as to the definition of an IRSI as used in the evaluation staff study. (In that context, it concerns a multi-functional institute, either multi or single-branch in coverage, in which R + D is a major component and not an industrial service institute providing basic services only.)

Speaking on the absence of a well-defined missions for IRSIs, another agreed that countries certainly differ from each one, but suggested it is necessary to refer to a central sector of developing countries which have some elements in common and that for these countries it is possible to define a model mission which will be helpful in creating new IRSIs. One cause of the problem arises from including the title "research" in the name of an institution, where in most developing countries the principal mission of such an institution will be to provide technical-economical service and not to do research. The services to be provided will probably tie in at an intermediary level between research and development, and the planning and execution of new industrial projects that an industrial firm would perform. Between these two well-defined levels, i.e., R + D and the normal activity of engineering firms, there is a range of activities where you give more importance to the technical elements in projects than engineering firms would. Here you have a more active processing of the technical aspects of a project, but not as much as creating a new technology, and this is the area he suggested IRSIs will find their place.

In many cases, this may include activities related to the transfer of technology, not only in the sense of transferring technology from one external source to a country, but mainly in co-operating with firms and helping them in some aspects of the technology transfer and adaptations process.

Returning to the question of IRSIs and the lesser developed countries, it was suggested that the basic justification for the establishment of a multi-branch industrial R + D institutes is the existence of the country itself. Every country, even the least developed ones, needs a small laboratory that can provide basic analysis of water samples for potability, food spoilage and contamination, mineral samples, testing of textiles, etc. In this case the "IRSI" title would be a misnomer. While it is necessary to avoid "reinventing the wheel", every country needs this type of an institution to get started on using modern technology, combined with economic considerations when possible. Doing nothing is not the answer. It takes a long germination period and one has to start someplace, recognizing that the research part may come 10 or 15 years later. In his experience, the research element usually comes in connexion with some indigenous natural resource. They have a particular material, be it mineral or wood species, that nobody knows anything about but they have plenty of it. This is where they take their first tentative step, what could we do with this? How could we utilize it? It is necessary when establishing an institution or designing a project of technical co-operation that the policy objectives of this little laboratory, or institute, or whatever you call it, are clearly established, so that the government and everybody understands what the institute or laboratory is really supposed to do in the next five years. Under these circumstances, perhaps there would be more success stories.

Another field representative questioned whether, in discussing the roles of IRSIs in national strategy at this juncture, the workshop was not putting the cart before the horse. Referring to their rather poor performance statistics, it is known that these institutions are not yet fully equipped to provide the advice to the governments on national strategies which they have not yet established. Therefore, it seems more profitable to consider how to strengthen these existing institutions, and how to put them on the right course, so that they become more viable and are ready to indentify needs any offer sound advice.

The Chairman concluded the Theme I by observing that it was a difficult subject to consider since national strategies are deeply interlinked with the problems of raising the performance of IRSIs, their expectations, and the effective utilization of their outputs. Therefore, he suggested that final conclusions should wait until the end of three sessions after which one can draw a fuller picture of what is the most effective role of an IRSI.

It is the obvious consensus that IRSIs are just one of the many elements of the industrial infrastructure and that their expectations should be limited. It is important to decide the role, that is, the policy objectives, an IRSI is expected to deal with. This should be clearly set up at the very beginning of any exercise. It is even necessary in the case of existing IRSIs which are not functioning as expected. In identifying the needs of a country or of a particular industry, a survey

is needed to establish the order of priority for the functional activities of the IPSIs. Such an institution needs to be co-ordinated with other industrial institutions, and there are a wide range of comprehensive and supportive measures required. Technical co-operation assistance should be considered on a long-term approach "programme" approach, rather than a series of individual projects or project phases. It is necessary for the IRSI to establish a reputation as a "center of excellence".

There are countries that have science and technology plans and policies, such as Korea and Mexico, and there are other countries beginning to tackle this problem, for example, Nigeria, Ghana, Indonesia and Turkey. The "push" effect vs. the "pull" effect is analagous to the problem of the chicken and the egg and is not a simple black and white proposition. It relates to the need for flexibility and tailoring an IRSI to the actual needs of a specific country, where in some cases the balance will favour one approach over the other. This is a vital question for consideration in the project design and early stages of IRSI institutional growth.

The Chairman concluded that in view of the governments interest in R + D as demonstrated in the number of projects submitted to the IPSTD, the evaluation exercise and this workshop is of great significance, because with the comprehensive approach and methodology that has been taken and the results of the efforts up to now, the elements are present for drawing up a series of practical actions for improving UN activities in the future for, what is after all the main focus, industrial development in the developing countries.



