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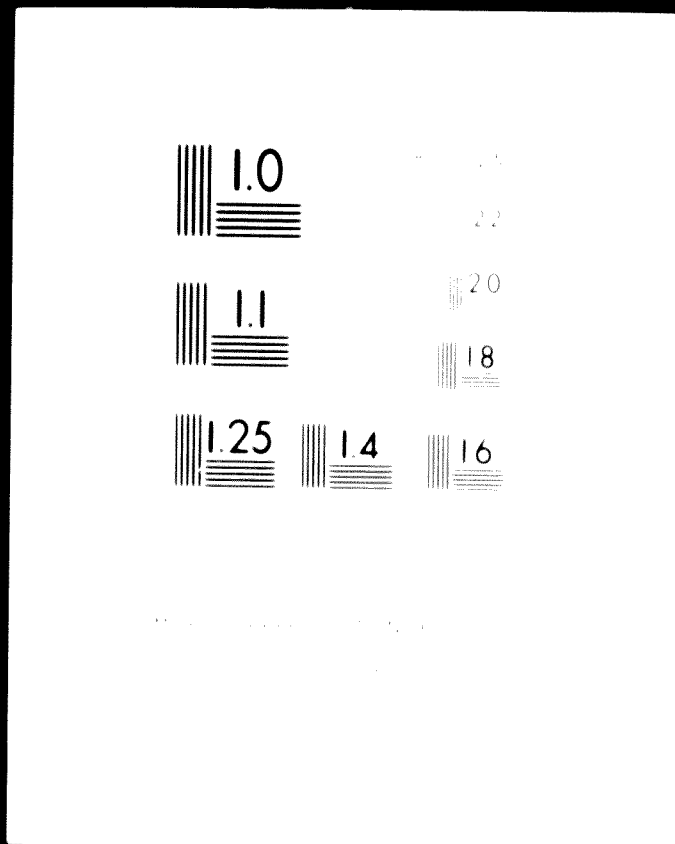
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FINAL REPORT TO THE  
INSTITUTE OF STANDARDS AND INDUSTRIAL  
RESEARCH OF IRAN (ISIRI)  
ON  
INDUSTRIAL RESEARCH

By Harold K. Work

June 15 1970

FINAL REPORT TO THE  
INSTITUTE OF STANDARDS AND INDUSTRIAL  
RESEARCH OF IRAN (ISIRI)  
ON  
INDUSTRIAL RESEARCH

June 15 1970

By Harold K. Work

"This report has not been cleared with  
the Bureau of Technical Assistance  
Operations of the United Nations which  
does not therefore necessarily share  
the views expressed."

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FINAL REPORT TO THE INSTITUTE OF STANDARDS  
AND INDUSTRIAL RESEARCH OF IRAN (ISIRI)  
ON INDUSTRIAL RESEARCH.

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FINAL REPORT OF UNITED NATIONS ADVISER TO ISIRI ON  
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1 INTRODUCTION

The Industrial Research Center of the Institute of Standards and Industrial Research of Iran (ISIRI) is located at Karadj, about forty kilometers west of Teheran. Building construction began in 1957 and was completed in 1959. The equipment was imported and installed in 1962 with the aid of the United States Point Four Program. Early in 1964 the laboratories came under the jurisdiction of ISIRI. During the next four years some forty research projects were undertaken. Practically none of these produced results that went into industrial production. Director General of ISIRI, Engineer Reza Shayegan, therefore, suspended all research activities.

The Government of Iran then requested from the United Nations the services of Harold K. Work as Adviser to ISIRI. His work was to encompass both the standardization and the industrial research sectors, with emphasis on the latter. The function of such an adviser had been described by Dr. Lal C. Verma in his report of August 1968, entitled "Advisory Services Report Relating to the ISIRI" as follows:- "His job description indicated that he will be attached to the Research laboratories of ISIRI at Karadj and assist in the formulation of long and short range research

\* United Nations Adviser on Industrial Research



programs, implementation of research projects, procurement of equipment, training of personnel, and advise on research laboratory management problems. It must be recognized that the Karadj laboratories are fairly well equipped and manned, but lack mature guidance by an experienced scientist with administrative background, who would create an atmosphere of enquiry and inspire the otherwise well qualified scientific workers employed there."

## II BRIEFINGS

### A. United Nations

On August 15, 1968, a visit was made to the United Nations Headquarters in New York City. The philosophy of the UN program was presented by Mr. Charles Cooper, and Mr. A. Hatami. Telephone discussions were continued with both of them over the next month, and pertinent material supplied by them was studied.

On September 29, 1968 a meeting was held at the Vienna headquarters of UNIDO. Mr. George Chen gave a summary of the requirements of the post, Mr. Vaughn explained the financial regulations, Mr. Novikov discussed the technical work to be done, Dr. Nassr presented a detailed analysis of the specific technical needs of the program in Iran, and very helpful background information about the dynamic activity there. He was joined by Mr. Radinbour who added recent material, especially about the program being undertaken in Iran by the Ministry of Economy.

At the end of the day another conference was held with Mr. Chen to summarize and clarify all this information. The adviser was impressed by the dedication of the UNIDO staff. Their helpfulness was appreciated.

On October 3, 1968 a meeting was scheduled by the Resident Representative, Mr. Edouard Collin, in the UNDP office in Teheran. As a part of this briefing, the adviser met Messrs. Raaen, Halbert and Ellis, and received final operating instructions. Mr. Singh was very helpful in expediting installation arrangements.

#### B. ISIRI.

Thereafter the adviser had meetings with Director General Mr. Reza Shayegan of ISIRI. He is deeply involved with this project, and anxious to ensure its progress. He presented members of his staff, both in his Teheran office, and at the laboratories in Karadj. The laboratories and equipment were inspected. Mr. Shayegan's deputy, Dr. Hossein Alizadeh, was present at most of these discussions. His understanding of the needs of ISIRI, and his cooperation in meeting them has had an important influence on the implementation of the present plans for research. UNAIR has depended on him for information and guidance. The facilities, personnel and leadership of the ISIRI program made a solid foundation on which to build.

Reports of preceding UN advisers were supplied by Mr. Ellis for background information. These were studied with care. Those prepared by Messrs. Verzan, Manuel and Vieweg were especially useful.

Originally two counterparts were assigned to UNAIR, Dr. Mir Hassan Mousavi and Mr. Darius Siassi. Due to serious illness Mr. Siassi was unable to continue in this position. Dr. Touradj Amirsoleymani then became a counterpart, with Dr. Mousavi.\* Especially at the beginning, all three counterparts supplied such needed background information about the laboratory and conditions in Iran, their evaluation of the work that had been done, the capabilities of the staff, and their analysis of the program to be initiated. As the association with these counterparts has progressed, rapport with them, and respect for their abilities has steadily grown.

### III ANALYSIS OF THE PROBLEMS

The direction taken to further an industrial research program in ISIRI must be influenced to some considerable degree by national plans and programs; the total activities of ISIRI, as well as by the situation in the industrial research laboratories at Karadj.

#### A. National Plans.

Iran is one of the small select group of nations that is rapidly moving from the category called developing nations to the category called industrialized. The reason for this is not hard to find. Probably the most important is the wise and forceful leadership of His Imperial Majesty Shahanshah Arya-Mehr. To implement his plans he has surrounded himself with an unusual group of dedicated ministers.

\* Personnel information on counterparts, in Appendix A, Personnel Chart.

Many of them hold graduate degrees from the world's best universities, and are well experienced in their special fields. It should also be noted that their background experience has had a distinctly economic interest. So, too, does the development program of Iran.

In many respects the development of Iran follows the general pattern set by Japan in its amazing progress to industrialization. That country adopted world technology so vigorously that for some time it was looked upon as an imitator. In recent years, however, Japan has evolved a strong industry with supporting applied research. No doubt it will eventually become a major contributor to basic research. It is interesting to compare the path followed by another great nation, India. There, a more scientific approach to the problem of developing an industrial economy has been followed. A number of national research laboratories - some for basic research, some for commodity research - were established, and a scientific policy committee was created in the cabinet. In summarizing the results of these efforts, Mr. V.K.R.V. Rao, then a member of the Planning Commission of the Indian Government, reported in a speech given in 1966 .... "With all this attention, support and these resources, we have not succeeded in accelerating our economic development significantly."

While these two examples need further analysis, it is believed that the scientific community would approve of the general pattern followed by India. They would perhaps explain what went wrong in terms of retarding factors. Engineers, on the other hand, who are generally as much concerned with economics as with science, would be inclined to follow the Japanese plan. In Iran the economic-engineering point of view seems to be dominant. The strong government leadership here will no doubt ensure that this wise path is continued.

B. ISIRI.

The Institute constitutes a small but important element in the industrialization of the country. It is an unusual organization in its breadth of coverage. The major divisions of the Institute are a standardization bureau, a testing laboratory, an industrial research laboratory, a hall-marking or certification organization, weights and measures, and a bureau to provide safe delivery of export goods. Recently a leather and hides laboratory and a Metrology Center have been added to the other responsibilities. In 1960 ISIRI had only seven engineers; today the staff is nearly one thousand. With this rapid growth and the complexity of services, it is interesting to note that all these functions, with the exception of the research, were operating reasonably satisfactorily. Steps were already being taken to correct the defects in the latter. Since UNAIR believes that the performance of an organization is a measure of the competence of its administrators, he considers ISIRI is in good hands.

C. Industrial Research Laboratories.

The research laboratories required much study. The necessary direction or administration, in its recognized form in industrial research, was practically non-existent. Since there were no experienced directors available some would have to be trained. This would also require a reorganization. These changes, when they were made by the Management, were done skillfully so that there was a minimum of dislocation and bruised feelings from the rearrangements. In fact the necessary changes seemed to benefit everyone.

The weakness in leadership, as would be expected, had had a detrimental effect at the working level. Morale was low. There was a marked tendency for the technical people to evade research assignments. The studies that were started were carried out like academic assignments, for which the research is the end in itself. There was no concept that the goal of industrial research must be the development of technology for industrial production.

This pattern is a common one for laboratories in developing countries. It is suggested that the condition is an outgrowth of the belief that research is a form of magic that can solve all problems automatically. Actually this is not the case. Hard work, skillful management, and perhaps just a little luck are the ingredients of successful research.

### E. Progress of Research

The research that first appears in a developing country is usually related to agriculture and medicine. Next comes adaptive industrial research based on foreign technology. This is imitative but constructive. Last comes research to improve quality and decrease costs. It may be either aggressive or defensive in character. Aggressive research seeks innovation or break through to give an industry advantage over its competition. Defensive research is conducted to keep the industry abreast of its competition, and is the more extensive of the two. For the present, Iran will derive most benefit from adaptive techniques.

## IV PRELIMINARY PLANS.

After evaluating all the information made available to him, and working according to the philosophy of research described above, UNAIR developed with the management of ISIRI recommendations concerning changes in organization, program and personnel.

### A. Standards

ISIRI work on quality control and standards has been continuing for some years under the direction of Dr. Alizadeh, and has already proved its value. UNAIR reviewed the activities briefly, and suggested a few minor changes in methods of grouping the standards and editing the English translations. For the current degree of industrialization of the country the status of the standards work is generally accepted as good.

Director General Shayegan is Vice President of the International Standards Organization, a tribute to his leadership, and recognition by its peers of the quality of the standards work at ISIRI. With the arrival of Dr. S.F. Sen, as United Nations Adviser on Standards, UNAIU minimized work in this area, and concentrated on the research program. Close contact between the two divisions is a distinct advantage, particularly in finding worthwhile projects. When an industry is consistently unable to produce goods within standard specifications, it is a strong indication that a research program is needed.

#### B. Industrial Research

To expand the program at ISIRI the following factors were considered:-

A judicious selection of projects and of a strong research-oriented staff; training of counterparts and staff; organization of personnel activities and research practices, including coordination with manufacturing and marketing; development of managerial techniques; and cooperation with universities and industrial laboratory research.

On the basis of these items, the activities of the ISIRI laboratory were restructured and a five-year plan was adopted.

#### C. Metrology

The laboratories for the Metrology Center at Karadj are being constructed. When they are in operation ISIRI will have the standards for the calibration of



weights and measures for Iran. It will be able to inspect and check all weights and measures, and make and repair equipment used for this and other purposes. It plans also to have references and handbooks available for all divisions of Metrology - mechanics, heat, electricity including electronics and photometry and metallurgy. UN Advisers Dr. Vieweg and Dr. Sen have the assignments on this project. UNAIR has participated only in a peripheral capacity in the planning and organization. He has also helped to prepare publicity and in the selection of staff.

## V ORGANIZATION FOR INDUSTRIAL RESEARCH.

### A. General Comments

An organization has two main purposes. One is to define the interlinkage or chain of command through which management plans, assigns and guides the activities of the working staff. The second is to ensure that the top and the intermediate levels of management receive reports from the working staff. This includes information on the technical progress, rate of financial expenditures, personnel activities, and the interaction of various departments of the organization, as are needed to perform the management function. It can be compared to a communication system through which a group of individuals - whose duties, functions and authority are clearly defined - are able to exchange, in an orderly way, the information needed to work together toward their common objective. The need for formal procedures varies with the size and complexity of the group.

There is no question that ISIEM is sufficiently large and broad in its responsibilities to require careful attention to its organizational arrangements.

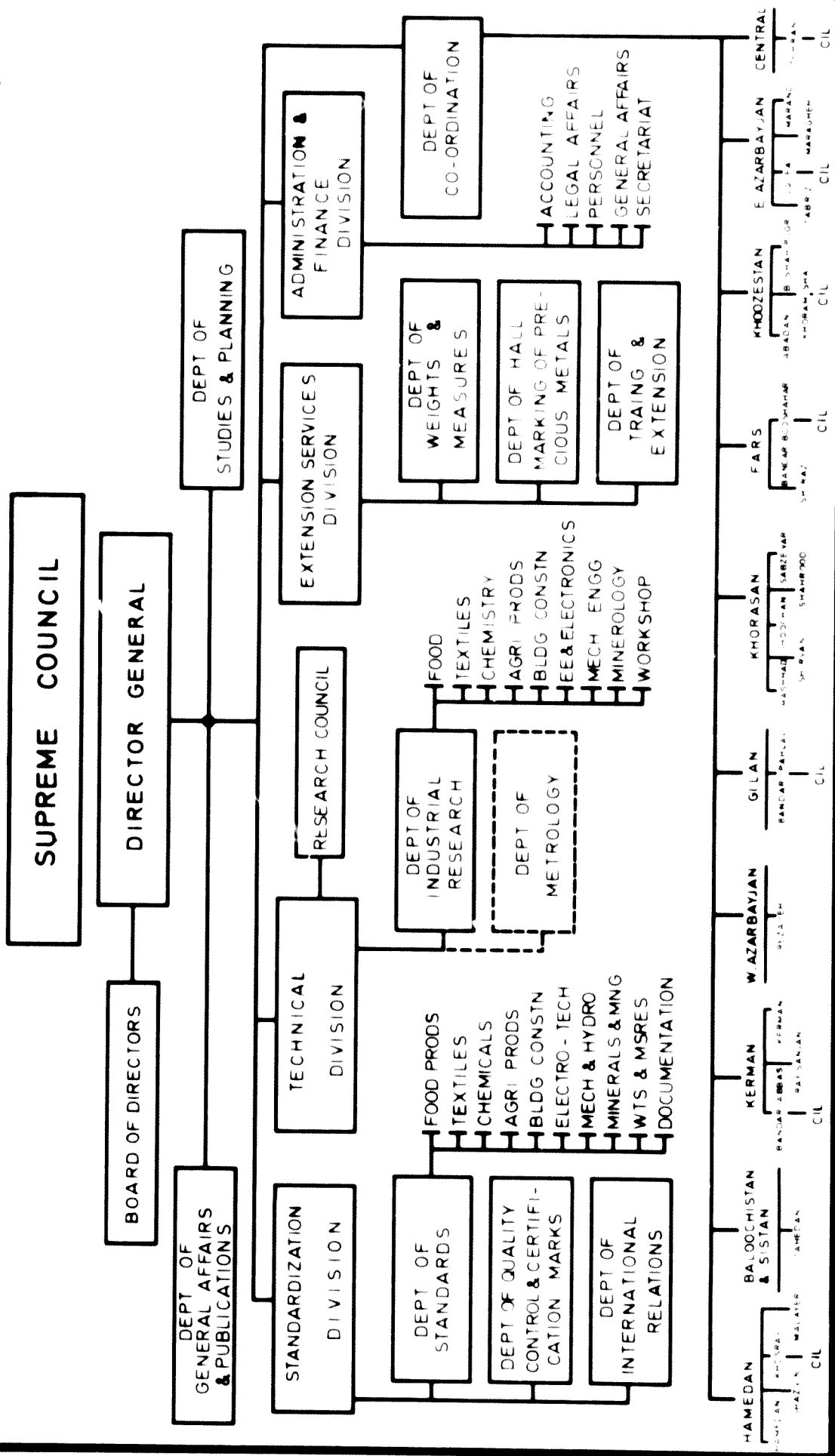
B. ISIEM Organization Plan.

The administrative channels which had been set up for the operation of ISIEM are shown graphically in Fig. 1. This chart, however, did not correspond exactly with the functioning of the Institute. The discrepancy was due, in part, to the recent merging at Karadj of two groups which had formerly been geographically separated. This has resulted in certain overlapping responsibilities. Added to this is another problem. The industrial research is new - about four years old - and is being incorporated into a large thirty-year-old organization. It has different requirements and presents new problems from a managerial and supervisory point of view. It has not been completely assimilated.

It was recommended therefore, that new job descriptions to clarify research management responsibilities, authority and accountability be prepared for the Director General's deputies, project directors and other research positions. Then, if necessary, the organization chart should be revised to correspond with the job descriptions. Work was begun by UNAIK on these job descriptions for the research supervisory staff. The Administration Division indicated, however,

# ORGANIZATION CHART OF ISIRI

## FIG 1



that it was its function to prepare such material and assumed the responsibility for this part of the reorganization plan. It remains to be demonstrated that the personnel in that department has the experience to complete this work. Procedures for initiating projects and operating them also had to be developed to conform to the above responsibilities. This has been done.

Another problem concerned with the organization chart centers around the broad scope of the Institute activities. Responsibility for setting the standards of the country, which in turn is closely related to quality control in industry, is a tremendous obligation in itself. Testing constitutes the largest function of the ISIPI laboratories, accounting for about eighty per cent of the expenditure. Such testing, as measured in terms of payment for service is growing rapidly. It has increased thirteen-fold in the last five years. Along with this increase there has been a change in the character of the work. Instead of simple tests the work has become more sophisticated. Frequently it requires teams of personnel and these may be interdisciplinary in character. In effect, the tests are often short term research programs. Along with this, the Institute has important industrial research assignments, the functioning of which must be closely examined. That the standards work and the responsibility for industrial research are both in the same organization is quite appropriate, providing certain precautions are taken. A parallel can be found in many industrial companies. It is fairly common for

research to have been an outgrowth of plant quality control activities. When operating troubles occurred, it was necessary to do a certain amount of investigation, generally of a short-term character. Eventually this testing led to longer term studies, or research. After a time it was generally found that such work could be more effectively managed if it were not mixed with the plant control sections, although both might be in the same division of the company. Reasons usually given to explain the separation are these:-

1. Research is a relatively long term undertaking, whereas quality control problems are shorter and more pressing. In a too closely coupled arrangement, research resources are too often diverted to solve short term emergencies.
2. The personnel required for research and for quality control work are somewhat different. A research staff member is expected to have a greater depth of technical knowledge (usually obtained by more advanced education); an imaginative and creative mind; and persistence to bring a long range program to a successful conclusion. A quality control person must be stable, practical and competent to handle emergencies. Research, in general, places more responsibility on the individual than is customary in quality control and standards work. There are exceptions to both categories, of course, and much overlapping of characteristics.

The co-existence of the research standards and testing work in the ISIRI laboratory has, for the

present, certain advantages for research in supplying supportive services and facilities. It did require certain changes, however, in the organizational set up and its management. The research and the standards work had to be separately assigned, although both use the same facilities. The sorting out and separating of these activities was not easy. Certain individuals required for research have obligations in standards work, so it is necessary to carefully consider each research appointment. It is important that the personnel understands its responsibilities, authority and accountability for their project activities. Through their respective division heads, both standards and research work report to one individual at the management level. As long as both sections are combined in one division, their need for separate identities and equal treatment must be recognized and provided for.

C. Personnel and Administrative Structure.

An organization for research is built around its staff, and has as a basic objective the stimulation of this staff to perform at its highest efficiency. Conversely the availability of qualified staff and how it is deployed establishes the effectiveness of the organization. In this connection, Dr. Mussavi, Chief of the laboratories, prepared at the beginning of this study an analysis of the training and experience of the ISIRI laboratory staff\*. This shows a group of twenty-three professional people and thirty technicians involved in the testing and research work. The

\* Appendix A - Personnel Chart.

Metrology Laboratory personnel has not yet been employed. Of the professional people at work, three had doctorates, seven had Master's and eleven had bachelor's degrees. In age they range from twenty-four to forty-one years. A rating was also made of these individuals to determine, as far as possible, their potential for research work. As was to be expected, from five to ten have the interest, training and characteristics required to develop into good research workers. In addition to these, professional help is obtained from the faculties of the local universities, under cooperative arrangements. Those from Arya-Mehr Technical University are listed in Appendix B.

The laboratories are under the direction of Dr. Touradj Amirsoleymani. He also personally supervises the industrial research with the help of a research management committee. UNAIR considers him extremely well qualified for his work. The testing, which represents about eighty per cent of all the work of the laboratory, is assigned to Dr. M.H. Mousavi. He is also well qualified and is doing an excellent job.

The principal interaction between ISIRI and UNAIR has been effected through meetings and discussions with these counterparts. From his background of research experience UNAIR has offered advice about organization, operation and solution of local problems.

He has tried to suggest how current situations could be met. Publications that should be helpful in the work have been assembled. In other words, there has been constant training by the tutorial method. Conferences are being held with Dr. Amirsoleymani almost daily. Shorter and somewhat less frequent ones are now held with Dr. Mussavi due to the pressure of his responsibilities with the testing division. All these meetings have been very satisfactory and productive.

Additional conversations are also held with other members of the staff. These are much less formal and more personal. An effort is made to consider with the researcher how he can initiate a specific project, how organize it and plan the program, and where he can collect information on world technology for it. Prospects for further education and training are of much interest, and are often discussed and evaluated.

When the research activities of the organization were reinstated, there was already available from the above group sufficient personnel to handle the program. This was particularly true since much of the earlier work was straightforward and depended on existing technology. As the research expands and the emphasis shifts towards innovation there will be a need for increased staff, and some with higher skills. This brings up an important issue. Every effort should be made now to upgrade the professional competence of the personnel, so that the people who start the work will not later have to be superseded by more professionally oriented individuals.



D. Services

After emphasis has been placed on the need for a well qualified staff, it follows that everything possible should be done to help this staff work at its highest potential. It should be supported by a good library and documentation center; well-equipped laboratories; readily available secretarial, clerical, purchasing, accounting, legal facilities, communications etc. A good research staff should be free to concentrate its full effort on solving research problems.

E. Future Projections

There are certain organizational and operating matters that relate to growth. A tentative projection was made of current and future projects and the staff that will be needed in the next five years. This is in Figure 2. It does not include major unit additions such as the international wool research laboratory or the leather laboratory.

There had been about ten projects of some promise on which some work had previously been done. In the last six weeks of 1968 there was time only to establish new procedures and reinstate five of these projects. Another seven were reinstated in 1969. There was an allowance for a twenty-five per cent growth in that year, and each year thereafter. Such figures are, of course, flexible. They constitute a rough guide based on present expectations but may be changed at any time the situation warrants it.

Figure 2.

TENTATIVE PROJECTION OF PROJECTS AND  
PERSONNEL FOR THE NEXT FIVE YEARS.

<u>Active Projects</u> <sup>a</sup>	<u>Year</u>	<u>Personnel</u>	
		<u>Professional</u>	<u>Technicians</u>
5	1968	8	10
13	1969	20	27
17	1970	27	36
21	1971	36	48
26	1972	48	64

<sup>a</sup> This represents the total numbers that are active in the year indicated; ones that have been completed are not included. Further, it does not include major unit additions such as the international wool research laboratory or leather and hides laboratory.

The analysis of anticipated personnel needs raises a basic organization question. What is the concept of long range industrial research at ISIRI ? Should the Institute attempt to become the primary and principal source of industrial research in Iran ? Or is its mission also to stimulate research activities in the industrial companies ? The latter course makes a most important contribution to the country. If this obligation is accepted ISIRI would have the following responsibilities:-

1. To initiate a research project(s) for an industrial company and transfer the work to the company when that company is ready to assume it.
2. To complete research for small or new companies not able to carry out meaningful programs on their own.
3. To undertake research for whole industries for which individual companies do not have adequate resources.
4. To conduct research of a general nature which involves the national interests.

To provide such an ambitious program places great demands on the ISIRI staff. Its personnel involved in industrial research should be competent engineers, well grounded in both the physical and social sciences to consider the economics, techno-economic and market aspects of projects. Once the concept is accepted that ISIRI's principal objective is to stimulate independent research by industry, it will have an influence on the personnel structure.

### G. Reports

At the beginning of this study, the organization was referred to as a two-way communication system between management and staff. It must be emphasized here because ISIRI has not yet completely evolved a satisfactory procedure. A monthly report on technical progress and on the rate of expenditure for each project is clearly needed. Information on successful work would be of value to the Director General in his activities to promote the Institute. Projects that show a lag in progress might be reviewed for recommendations to stimulate more effective action. They provide the research director with the current status of the program. Fiscal reports remind both management and staff of the cost of the work and the need to produce results. Further, it is through budgetary control that management can exert a major influence on the work in directing it to meet its established objectives.

## VI PROGRAM FOR INDUSTRIAL RESEARCH

### A. General Considerations

Planning an industrial research program can vary from a rather simple procedure to a most complex exercise in management. There are, for example, corporations whose futures are critically associated with research. In some of these the planning work is broken down into two parts; management plans the general course of action or strategy for the research, the supervisory people develop the specific program or tactics to accomplish it. In a general way the

basic pattern is the same in Iran. The Government, through the Plan Organization, develops the strategy; the appropriate ministries develop the tactics to implement the strategy. The Plan Organization has presented the following strategy:-

During the Fourth Plan, the private sector will participate in the extension of industrial activities of the country by investing in the following industries:-

1. Basic Products: Paper, Cement, artificial fibers, chemicals, rubber and chemical fertilizers.
2. Foodstuffs: Dairy products, sugar, dried fruits, packed dates, canned goods, vegetable shortening, alcoholic and non-alcoholic beverages, cattle and bird feed.
3. Manufactured articles: China, crystal, bicycles, motor cycles, other vehicles, carpets, handcraft articles, textiles, wood products, glass jars, pharmaceuticals, cable, pipe and electronic devices.
4. Equipment: Rolling Mills, electric motors, compressors, filters, cold storage equipment, weighing devices etc.

In order to undertake the above program, industrial research and engineering is required to adapt existing technology to meet Iranian needs. After the industries are established independent research will be needed to keep Iranian products competitive in the world markets.

Obviously it would require a much larger organization than ISIIRI to conduct research on all the activities listed. At best the Institute can attempt to follow only the intent of the plan. The problem is to select those projects for which there is the most pressing need. Consideration must also be given to projects that can be properly developed into industrial production; in other words, ones for which materials, man power, and capital are available. The research resources are also particularly pertinent to a wise selection of the research program.

B. Research Management Committee

To assist the Director of Research in choosing a satisfactory group of projects for study, a Research Management Committee was established. Its function is to consider all phases of research management, but its primary responsibility is the guidance of the program. This committee has the following composition:-

- T. Amirsoleymani, Chairman
- A. Kianpour
- M.H. Mousavi
- D. Siassi
- R. Rahnama
- R. Shayegan (Director General, Ex. Off.)
- H. Alizadeh (Ex. Off.)
- H. Work (Ex. Off.)

Meetings are scheduled weekly.

It was decided that each project under consideration must be submitted in a detailed proposal by the appropriate individual - usually the person who is expected to be the project director. The material should be summarized in an outline and be accompanied by a budget. Then it is reviewed by the committee, and its acceptance, modification or rejection is recommended to Mr. Shayegan.

### C. Selection of Projects

The committee began to reconstruct the program by accepting the five-year plan given on page 20. To reinstate the first five projects in 1968, some forty possible subjects were reviewed, and reduced to eighteen as follows:-

- |                       |  |
|-----------------------|--|
| 1. Storage batteries  | 10. Carpet dyes                                  |
| 2. China ware         | 11. Textiles                                     |
| 3. Date juice         | 12. Vegetable extracts<br>(orange, tannins etc.) |
| 4. Rice Bran oil      | 13. Electrical insulators                        |
| 5. Rice hull concrete | 14. Carbon (active and<br>inactive)              |
| 6. Metals             | 15. Molasses utilization                         |
| 7. Plastics           | 16. Highway safety                               |
| 8. Cold asphalt       | 17. Bagasse use                                  |
| 9. Bleaching earths   | 18. Gum tragacanth                               |

The following five, and one feasibility study were selected for consideration:-

- |                      |                                      |
|----------------------|--------------------------------------|
| 1. Use of Rice Hulls | 4. Gum Tragacanth                    |
| 2. Wool Dyes         | 5. Storage Batteries                 |
| 3. China Ware        | 6. Electrical items<br>(feasibility) |

All six items were individually reviewed by the Committee which then recommended them to the Director General of ISIRI for approval. The details of these recommendations are given in the following five pages on the forms adopted for initiating projects. In passing it should be noted that (1) all of them take advantage of readily accessible Iranian resources (2) all have immediate practical application by industry or agriculture and (3) all have a waiting market. With the selection of the 1968 program, work was begun on the 1969 program.

In addition to the selection of program to be undertaken the Research Management Committee hears progress reports on two or three projects each week. These are discussed in detail. Usually a few ISIRI guests are invited to attend these sessions. Both guests and members are encouraged to introduce for comment the dissatisfactions or grievances they may feel about their work. This opportunity for frank expression has improved morale and increased cooperation among the personnel. The meetings have proved their value in coordinating and guiding the program and in stimulating interest.



ISRI PROJECT OUTLINE

No. I-1-69

Section C.2.

Date: April 1969

Subject: Use of Rice Hulls as an Engineering Material.

Value to Enterprise (include brief summary of economic and market justification).

In Northern Iran each year more than 300,000 tons of rice hulls are wasted and are removed from the rice factories with some cost. However, the mixture of rice hull ash and lime produces lightweight material which is most suitable for shallow blocks used in walls or concrete roofs. As masonry bricks are not manufactured locally, there is strong economic and market justification for production of blocks.

Plan of investigation (second stage)

1. Design of pilot plant to manufacture shallow blocks
2. Determination of workable mix to give highest strength-weight ratio and lowest cost-weight ratio.
3. Study of heat conductivity permeability, bond and other related physical properties such as abrasion and impact.
4. Effect of chemicals and weathering.
5. Investigate the type of mix reported by a French Institute.
6. Study and collect the literature available on this subject.

Completion Date: 8 months from the endorsement.

Cost: Rls. 760,000      Special Capital Expense: Rls 210,000

Project leader: T. Amirsoleymani      Reporting Schedule: Each month.

Personnel Requirements: 1 Engineer, 2 Technicians, 1 Expert.

Industrial Contact: OMMIA SAGHF COMPANY

If this is a continuation of a previous project, give the following information:-

Date of original Project: September 1967

Total sum spent in previous periods: No records.

Authorization:

Date of endorsement by Administrative Committee - 6.1.69

Approved by Director General. Signature.....Date.....

Approved by Board of Directors.

Signature.....Date.....

SIRI PROJECT OUTLINE

No. 1-2-68  
Section: Chemical  
Date: Feb. 1969

Subject: Natural Dyes for Carpets.

Value to enterprise (include brief summary of economic and market justification).

Carpets constitute Iran's second largest export (about \$ 120,000,000) and give employment to 1 million people (part time and full time). Dyeing is a significant part of carpet making and this study is designed to improve the dyeing of wools for carpets.

Plan of investigation: After consulting with the Iranian Carpet Company it was decided to begin the work on the extraction of dye from natural raw materials. Testing of the dyes will largely be done by the carpet company to take advantage of their experience and facilities.

Completion Date: Several years - work will expand.

Cost: 1,016,000 Rls. Special Capital Expense: 500,000 Rls.

Project leader: E. Taherna. Reporting Schedule: Monthly

Personnel Requirements: Two chemists, one technician, one dye engineer, one laborer.

Industrial Contact: Iranian Carpet Company.

If this is a continuation of a previous project, give the following information:-

Date of original project:-

Total Sum spent in previous periods:-

Authorization:

Date of Endorsement by Research Administrative Committee: 6.1.69

Approved by Director General ... ..  
Signature Date

Approved by Board of Directors ... ..  
Signature Date.

ISIRI PROJECT OUTLINE

No. I-3-69

Section:

Date: 1.1.69

Subject: Chinaware

Value to enterprise (include brief summary of economic and market justification).

Most of Iranian chinaware is imported. However, Iran has raw materials that would seem ideal to sustain a good chinaware industry. The aim is to investigate the Iranian raw materials with a view to establishing a domestic chinaware industry.

Plan of Investigation:

1. Test available raw materials
2. Estimate the quantity of suitable raw materials
3. Produce chinaware samples
4. Study the economics of production
5. Study the pilot plant

Completion Date: Approximately 1½ years

Cost: 1,800,000 Is. Special Capital Expense: 450,000 Is

Project leader (acting): Firheroon. Reporting Schedule: One month

Personnel Requirements: One engineer three technicians

Industrial Contact: Not available - no industry in Iran.

If this is a continuation of a previous project give the following information:-

Date of original project: June 1965

Total Sum Spent in Previous Periods: Not available

Authorization:

Date of endorsement by Research Administrative Committee: 6.1.69

Approved by Director General .....  
Signature Date

Approved by Board of Directors .....  
Signature Date

ISIRI PROJECT OUTLINE

No. I-4-68

Section: Chemical

Date: March 1969

Subject: Gum Tragacanth.

Value to Enterprise (include brief summary of economic and market justification).

A total of 2363 tons of Iranian Gum at a value of 260.6 Million Riels was exported during 1968. This project is designed to increase the net value of such gum in the international market.

Plan of investigation:

1. Evaluation of viscosity of all exportable grades of gum (whole gum)
2. Effect of grinding at various temperatures on viscosity.
3. Variation of viscosity on mixing various grades of gum
4. Study of the reasons for the apparent decrease of viscosity of gum during transport to Europe and N. America.

Completion Date: 1.2.1349

Cost: 790,000 Rls Special Capital Expense:

Project leader: N. Yalpani. Reporting Schedule: Every 3 Months

Personnel requirements: Engineer part-time and one Assistant.

Industrial Contact: An export merchant.

If this is a continuation of a previous project, give the following information:-

Date of Original Project:-

Total Sum Spent in Previous Periods:-

Authorization:

Date of endorsement by Research Administrative Committee: 6.1.69

Approved by Director General .....  
 Signature Date

Approved by Board of Directors .....  
 Signature Date

PROJECT OUTLINE

No. I-5-68  
Section: Electrical  
Date: March 1969

Subject: Storage Batteries

Value to Enterprise (include brief summary of economic and market justification).

As the result of consumers' opinion and standard tests on storage batteries used on cars, it is becoming clear that research is needed to improve the quality of batteries to meet world standards.

Plan of Investigation:

1. To compare the properties of Iranian batteries with respect to the world specifications.
2. Carry out a program of research to correct any deficiencies.
3. Apply the correction to industry.

Completion Date: 1 year (approximately)

Cost: 1200000 Rls. Special Capital Expenses: 200,000 Rls

Project Leader (Acting): Stelman. Reporting Schedule: One Month

Personnel Requirements: One engineer, two technicians.

Industrial Contacts: Niro Battery Company.

If this is a continuation of a previous project, give the following information:-

Date of original project:-

Total Sum Spent in Previous Periods:-

Authorization:

Date of Endorsement by Research Administrative Committee: 6.1.69

Approved by Director General	.....	.....
	Signature	Date

Approved by Board of Directors	.....	.....
	Signature	Date

D. Industrial Contacts.

If industrial research is to be undertaken, it is necessary to know the needs of industry, develop a program based on those needs and arrange for the necessary cooperation while conducting the research and applying the results.

At first glance the industrial research of ISIRI presented a curious picture. While the name "industrial" implied interest and participation there was relatively little direct interaction between industry and the research of ISIRI. This was also noted by earlier UN Advisers but for all practical purposes the situation continued to exist. Thus when the projects were reinstated a special effort was made to develop such contacts. The situation for the five projects and the feasibility study started in 1968 is as follows:-

<u>Project.</u>	<u>Industrial Contact</u>
I.1 Use of Rice Hulls	Omnia Saghf Co. is following the work and expects to install a pilot plant
I.2 Wool Dyes	All dyeing is done by Iranian National Carpet Co., which has volunteered financial support to extend activities and construct a pilot plant.
I.3 Chinaware	No industry exists in Iran.
I.4 Gum Tragacanth	Iranian Sales Company cooperating.
I.5 Storage Batteries	Cooperation with Niro Battery Co.
F.1 Electrical Connections	Contacts have been made with Westinghouse and AT&T, who have agreed to cooperate.

Despite the prompt improvement of industrial involvement in the work, more attention must be given to this area. UNAI felt the need to personally consult with Iranian industrial and institutional personnel and to become better acquainted with their requirements and attitudes towards research. Visits were made to the Geological Survey Institute, the National Iranian Oil Company, their laboratory at Rey, their refineries at Abadan, the National Petrochemical Co., National Iranian Steel, Co., Teheran University, The Iran National Co., Iran Tile Co., Niro Battery Co., Glass Co., Razi Institute, Ahwaz Sugar Refinery Co., the National Carpet Co., and others. There has been a systematic attempt to arouse interest in and support for industrial research wherever it was appropriate.

Reference has been made in the discussion of preliminary plans for industrial research to a staff, under SIRI guidance, which would gradually be transferred to industrial companies. The plan would work somewhat in this fashion. A research project relating to a specific problem of a specific company would be undertaken at SIRI. The company involved would help select and employ the researchers. This kind of cooperation aids in establishing close and cordial working arrangements between the laboratory and the industry. It is important, for a smooth relationship between the two is often difficult to achieve. It might even be desirable to appoint an industrial counterpart on each project. When these persons complete a program at SIRI they could be moved with the project to the company that supported it.

The company would then continue industrial research on its own, with perhaps some further guidance from ISIRI. Each company can eventually do much of its own research once it has trained staff to do it. The knowledge of the problems, the desire to resolve them, and the ability to pay the required salaries for good research people gives industry distinct advantages. Usually the most effective research is done by the organization which stands to gain the most from the results.

2. Contacts with other Ministries.

Attention has been directed towards ISIRI contacts with industry because, formerly, such contacts were quite limited. Focusing attention on industry, may lead to the impression that contacts with Government agencies are not well developed. Actually in view of the small size of the program, at present, the contacts are adequate. They may be summarized as follows:-

1. Ministry of Agriculture. Many of the materials that ISIRI works on are of agricultural origin. As a consequence ISIRI personnel have frequent and friendly contact with various parts of the Ministry.
2. Ministry of Economy ISIRI is part of this Ministry. but has active contact with such other parts as the Geological Survey Institute, Trade Promotion Center, and others as required.
3. Ministry of Post, Telegraph and Telephone. This Ministry has offered to cooperate with ISIRI.



4. Ministry of Science and Higher Education. Contacts with this Ministry have been with individual universities. At present ISIRI has a working agreement with Arya-Teher University and informal working arrangements with the National University and Teheran University and may eventually work with Abadan Institute of Technology.
5. Iranian Army. ISIRI is working with the army on several products of interest to the army program.

F. Program Support.

Industrial research is a means for developing technology for industrial production. This must be emphasized over and over again. Its success is measured in terms of that production and every effort must be made to carry on the work to that end. Any public relations value of the research should be considered a by-product not a primary objective. Industrial research is a long term activity. It is advised that the minimum industrial research project be set at one man-year. There will be certain exceptions to this, particularly while the laboratory is new. Some short projects may be undertaken for quick results to bolster morale and gain acceptance of the laboratory by outsiders. Exploratory or feasibility studies will also be of shorter duration. Certain short term studies needing specific research equipment or personnel, too, can be handled as special projects. Despite the need for these exceptions, the goal of the minimum input requirement of a man-year is recommended.

Research has been so glamorized everywhere that its time-consuming nature and uncertain results are ignored. Results are expected immediately. In reality it usually takes several years from the start of a major research project until the results mature into industrial production. In other words, money invested in research must be patient money. Furthermore, many successful programs are criticized in their early stages for lack of sufficient progress but they cannot be put on a rigid time schedule.

A research program is at best a difficult and uncertain enterprise. It is by nature a speculation. It is not possible to predict accurately in advance just where the research will lead. This must be clearly recognized in the administration of the research. At times the work will need the support of the management to carry it through critical periods. There should be a mutual effort by both staff and supervisors to move the program forward in spite of frustrations, criticisms and disappointments. Some of the early work at ISIRI was abandoned too soon, because the research workers became discouraged.

#### G. Pilot Plants and Economic Studies.

Earlier consultants have noted the lack of pilot plants in the ISIRI activities. It is believed that this situation was primarily the result of the slow tempo of the earlier research. As a matter of fact in the five projects that have been re-established, steps to set up pilot plants were soon planned for two of them.

Lack of economic and techno-economic studies have also been noted by other consultants. Thus far some economic and techno-economic studies have been made by the engineers on the projects. They have probably been adequate for the present stage of development of the program. However, it is in modern practice, considered undesirable to have research engineers do this part of the work for their own projects; generally their costs are too low and their predicted selling prices too high. Therefore, it has become customary to have a separate and specialized group do this work for all projects. It is not too early for ISIRI to start thinking about the organization of such a group. It is suggested that steps be taken soon to initiate such activities either by employing a suitable man to build a program or by having economists in the trade development group of the Ministry of Economy supply such services.

#### H. Evaluation of Performance.

Once the reorganized program is operating smoothly some thought should be given to the complex subject of evaluating the performance. In a factory the production operations can be evaluated in terms of money spent versus the value of the product produced by this expenditure. In industrial research of a company the problem becomes more complex; it is difficult to place a precise value on the research. In the case of ISIRI the evaluation of the research is somewhat simpler for profits are not directly involved.

It is merely necessary to record the industrial production that results from the work. This should be done regularly by the ISIRI staff. From time to time this should be supplemented by calling in consultants who have a background which allows comparison of the performance of ISIRI with that of similar organizations in other countries. It is also good from time to time to farm out some research to outside organizations so that their performance can be used as a yardstick for comparison with the ISIRI work. Battelle Memorial Institute, Carnegie Mellon University, Stanford Research Institute, Arthur D. Little, Research Triangle Institute or similar organizations in Europe could be used for this purpose. One thing is clear, namely that constant evaluation of the work is needed to keep the activities at top performance. A list of references is given in Appendix ~~E~~ which describe attempts by others to evaluate their research.

#### I. Technological Assessment.

In some of the highly industrialized countries, it is beginning to be recognized that new technology developed by research must be evaluated for its overall effect on the country. For example the mechanization of agriculture is considered to be an important contribution of research, and indeed it is. It frees a large labor force for the expansion of industry. In the areas where there is no large industry to absorb labor, however, displaced farmers drift into the slums of the cities. Similarly the mechanization of mines causes large areas of a country to become depressed areas. The expansion

of the use of automobiles has caused a series of problems affecting health and the safety of the people. Factories in or near cities have caused air and water pollution problems. This is already noticeable along the highly industrialized Karadj highway. Early planning is an essential for long range well being. The activity known as technological assessment is beginning to be considered a social need. Iran has recognized this in its geographical dispersion of industry but, as manufacturing continues to grow, this subject will need even further attention. This should be a responsibility of a national research program.

J. Status of Approved Projects, May 1970.

11-68 Rice Hulls.

Waste Rice Hulls have attracted the interest of many investigators. Attempts have been made to use them to produce humus in soils or as a component in cattle feed. This study was directed toward the use of rice hull ash as a constituent of lightweight cement blocks. A French process does this with partially burned hulls but requires expensive equipment and skilled labor. The ISIRI study is currently concerned with use of substantially fully burned hulls, because it requires simple equipment and can use unskilled labor. The first studies consisted of producing small test blocks and evaluating their properties. When satisfactory results had been obtained in the laboratory, a pilot plant was supplied by the Oania Saghf Company, and some large complex tiles were produced. The results

were sufficiently good to allow submitting roof tiles to the company for their examination. The tile was considered promising but not quite strong enough for manufacture. It was decided that higher pressures were needed for pressing the blocks. New equipment has been procured by the company and another series of tests will be carried out by ISIRI. A paper describing this work was presented recently at a CENTO meeting at Lahore.

F2-68 Natural Dyes:

This project is part of an extensive study now concentrated on the extraction of dyes from Iranian raw materials. The first compound ISIRI studied was Ladder. A series of colors was produced, including some new ones, by varying the extraction methods and after-treatments. The Iranian National Carpet Company has collaborated in the work, doing the dyeing in their laboratories. It has expressed interest in using several of the new colors. Work has also been started on the extraction of dyes from walnut hulls. This will follow the same comprehensive treatment as the testing of the Ladder dyes. The project is considered very promising. It is expected that the results will contribute to the uniform color fastness of Persian carpets which constitute Iran's second largest export product.

P3-68 Chinaware:

A study is underway to determine if Iranian raw materials can be used to support a domestic chinaware industry. An excellent laboratory has been set up, and the techniques of producing chinaware on a laboratory basis have been studied. Recently an additional man has been employed specifically for this project. It is expected that the work will now be accelerated.

P4-68 Gum Tragacanth:

This project is designed to explain the wide variations in the value of gum tragacanth, and to find methods for improving the quality of low-grade material. The special equipment for measuring viscosity has finally been received and the laboratory work has begun. It is too early to predict the results of this study.

P5-68 Storage Batteries:

Frequent reports that storage batteries made in Iran were below standard have prompted a two-part study of the subject. The first part has been completed, and has determined that the batteries are indeed deficient in several respects. These findings were discussed with the manufacturer, who has agreed with them. He has offered to conduct the research on corrective procedures in his own laboratory with the advice of ISIRI staff. This project is considered complete unless the battery maker fails to act. If so, it will be reinstated.

I6-69 Raisin Cleaning:

The current method in the Middle East of converting grapes into raisins is to dry them on the ground. Sheep passing through the fields frequently contaminate them. It is necessary, therefore, to devise ways to remove all foreign material from the raisins. After a brief review it was evident that this could best be accomplished by hydraulic methods. A project was established under the supervision of a hydraulics professor at Arya-Mehr Technical University. Equipment was designed which successfully cleaned the raisins. The first of these machines has been built, sold and put into operation.

I7-69 Food Radiation:

When visiting India a high Government official became interested in some experiments being conducted there on the use of gamma rays for (1) inhibiting the premature sprouting of onions and potatoes, and (2) the preservation of foods. He referred the subject to ISIRI for appraisal. After a preliminary survey, it was decided at ISIRI that a four-part program was needed. This includes the following steps:-

1. A study of technical feasibility.
2. An economic study.
3. An engineering study of equipment.
4. Development of specific technology.

Several countries known to be working in this field were approached for information but did not reply. The United States Army Natick Research Laboratory did send UNARR extensive material on the subject.



With this help, the feasibility study was made. It was concluded that the radiation of root crops to stop sprouting was technically possible, and that radiation treatment might also be used for the preservation of vegetables, meat and fish products. It was decided therefore, to proceed with the economic study under the guidance of Dr. Agah, a leading economist and former Iranian representative to the United Nations. In the meantime, Dr. Edward Josephson, who heads the radiation program of the Natick laboratory, was invited to stop off for several days on his way to India, for consultation with ISIRI. He advised how a program might be organized. The particular point he emphasized was that the research should be a multi-disciplinary project, involving agriculture, science, engineering and health. He suggested that a commission be established to include these four Ministries, under the leadership of the Ministry of Economy, to guide the program. ISIRI has since been directed to prepare the plan for this work and has recommended the above organization for it.

IR-69 Welding:

Welding is extensively used in Iranian manufacture and construction. There is increasing concern as to whether or not the welds produced here are consistently strong. A program has been started to evaluate weld quality, and to make recommendations if further action is needed.

F9-69 Turquoise:

Iran has an enviable reputation for the beauty and hardness of its turquoise. It has been found that some inferior mineral is being artificially colored to resemble good material. Since ISIRI is responsible for maintaining the quality of Iranian exports, it is very concerned about this. A test, easy to apply, must therefore be found to distinguish between the fine quality gems and the ones that have been treated. Progress on this has been slow due to the serious illness of the project director.

F10-69 Asphalt Roads:

During the winter of 1968-69 the asphalt roads in Iran did not perform well under the rigors of the weather. The Mayor of Teheran requested ISIRI to make recommendations for correcting this. As a first step, a series of seminars has been arranged between ISIRI and the University of Teheran to survey all aspects of the problem. At present there are indications that the bitumen may be at fault. If this is confirmed, ISIRI intends to make a detailed study of this phase of the subject with the cooperation of the NIOC laboratories. In the meantime information is being collected and abstracted on the general subject of road construction.

F11-69 Wire, Cable, Switches etc:

Numerous fires and accidents in Iran have been ascribed to faulty wire and electrical accessories. Preliminary investigation has indicated that the complaint is justified. A wide-ranging study has been

started to evaluate and suggest corrections that can be employed in Manufacture to avoid these dangers. In order to facilitate the work the electrical laboratories at ISIRI have been remodelled. Evaluation of commercial products is now progressing.

I12-69 Packaging:

One of ISIRI's prime responsibilities is to see that Iranian shipments arrive at their destination in good condition. Any damage claims that are sustained against exports are charged to ISIRI. Understandably, the Institute is very concerned with packaging for product protection. A preliminary survey has been made to guide future activities. Recently tests have been completed on two materials plastic bags and plywood boxes, to study their suitability as containers for tea shipments.

The pattern of the overall program has been influenced by the following factors:-

1. An effort to advance the economy of Iran;
2. An attempt to improve the quality of exportable goods to benefit the foreign exchange ratio - a basic policy of the Ministry of Economy.
3. A desire to salvage as much work as possible from former research programs.
4. An improvement in safety practices in the country.

## VII PERSONNEL

By far the most important single factor in ensuring the success of a research laboratory is the personnel. It, more than anything else, will determine the productivity of the laboratory. The personnel also constitutes the largest single cost in the operation of a laboratory. The investment in each individual staff member should be conserved just as carefully as investments to produce income are treated. The skill in managing such investments is critical to the welfare of the organization. Therefore the assembling of a good staff, its proper organization and guidance, adequate facilities and supporting services are the surest ways to produce good research.

### A. Inventory.

#### 1. ISIRI

At the beginning of the work on the reactivated program Dr. Nassavi completed a study of available ISIRI personnel. At that time, December 1968, there was sufficient staff to carry on the work. Since then, however, recruiting more well trained and competent people has become the most difficult problem facing the industrial research. This search does not extend to the administrative level for there, fortunately, ISIRI is adequately supplied with qualified people. At the laboratory level, however, the situation is affected by the following conditions:-

- a) The number of available high quality trained research people is too small.

- b) Government salaries for technical positions are unrealistically low.
- c) Industry pays higher salaries, so has the advantage in the labor market.
- d) Other factors being equal, many scientific and technical people prefer the prestige of university appointment or working in new and glamorous areas such as nuclear science.
- e) The enlightened policy of ISIRI of granting leave of absence to some of its best people for study or plant practice presently adds to the shortage but will have long range major benefits.

To further complicate the problem of hiring a competent staff are internal organizational and budgeting practices. After being given approval to hire someone, the director of industrial research may be told that there is no money in the budget. Then again, if an applicant is hired, he may not be paid for months. This is no way to build a staff.

In spite of these handicaps it has been possible to keep the program functioning by using as project directors the director of the laboratories and two university professors. An immediate solution to the personnel problem is urgent. This is recognized in a general way and is included in the Fourth Plan of the country.

## 2. Universities.

Additional personnel may be recruited from universities on a part-time basis. Discussion with Dr. Babayan, President of the Abadan Technical Institute indicated that some members of his staff would be interested in working with ISIRI if suitable projects could be found.

An arrangement has been concluded with Arya-Mehr Technical University for cooperation in the area of industrial research and education. The members of the university staff who have expressed a desire for such cooperation, and their particular interests are shown in Appendix B. Some eight projects were presented to the faculty of the University and two were implemented. One was concluded successfully, the second was discontinued by mutual agreement.

One part of a project is under the supervision of Dr. Agah of Teheran University. It involves a study of the economics of the use of gamma rays for the preservation of food.

Other interchange between ISIRI and the Universities might involve:-

- a) Limited use of ISIRI personnel in appropriate teaching activities, but exclusive of routine administration of courses.
- b) Use of suitable ISIRI applied research projects as subjects for theses for academic degrees. This could bring new graduates into the program.
- c) Use of ISIRI equipment for demonstrations for educational purposes.

effort. They may constitute about fifteen per cent of the professional people. This is the group to concentrate on although the characteristics mentioned will be desirable to a degree in the rest of the staff.

In classifying research leaders their characteristics are placed in the following order:-

1. Creativity. This has been defined as the ability to generate new ideas and recognize new values. It has often seemed to UNAIR that creativity may be divided into two parts - creative thinking and creative doing. There are researchers who have good ideas but who do not put them to use. Men like that always need "doers" in their groups to implement their ideas. Conversely some people can effectively carry out a project once the program has been outlined for them. In any event unless there is a considerable amount of creative talent in a laboratory it is not likely to survive. It is not enough to start with this sort of staff - it must also be retained. In one laboratory, whenever an important advance was made, the individual primarily responsible left the laboratory to do the promotion work on the product. In a short time, the laboratory had been stripped of its small group of highly creative people and it became lifeless and non-productive. This retaining of a good permanent staff is very necessary. It does not apply, however, to the researchers being specifically trained for transfer to industry.

2. Knowledge of Scientific Fundamentals. This is most readily measured in terms of formal education, which can take one of several directions. One is to broaden the researcher's knowledge, so that he can approach a

problem with his mind open to all possibilities of solving it. Another way concentrates on, and increases his learning of, the specific area in which he is working. Both of these methods have merit. The problem is how best to evaluate the use of these approaches in solving specific technical problems. While it is recognized that formal education is used as a measure of knowledge, it has certain limitations. For example some individuals retain the facts learned in school better than others. Some learn better by self-education than formal training. So also education gained by work experience cannot be discounted. At the beginning of a researcher's career this factor has not been developed but in time its importance will outweigh the formal education factors.

3. Energy and the Desire to Accomplish the Work.

These are most important requirements. The energy factor is obvious. It does have particular significance in ISIRI where the hours of the workday are short, and consequently must be made very productive. Outstanding research workers are people of great determination. They almost seem to feel that anyone who interferes with the progress of their work is trying to steal their livelihood. Even a casual reading of the biographies of research leaders will bear this out. Expressed in another way, there is no doubt that many good projects have failed because the researcher gave up too easily in the face of obstacles.

4. Ability to get along with others. This is generally considered a significant quality. Lack of it, however, can sometimes be overlooked in certain



individuals whose other characteristics and abilities are too outstanding to forego.

D. Personnel Administration.

1. Selection of Personnel.

a) The Problem. The majority of important research discoveries have, as mentioned earlier, been made by a small minority of those engaged in research. Past performance is the best indicator of expected future success. Since people of established reputation are hard to get, this cannot be the complete solution of the problem. It is necessary also to select people of high research potential, (bearing in mind the characteristics already discussed), and then provide them with conditions that favor high productivity. The evaluation of prospective personnel can best be done by experienced men in the same field of interest. Scrutiny of the candidate's academic record will furnish a fairly good measure of intelligence and general knowledge. The employment history and recommendations will often reveal significant personal characteristics. All this information should be assembled and studied.

b) Interview. Another aid to employers in evaluating research recruitments is the use of personal interviews, and they should always be included in any selection of staff. They can be skillfully arranged so as to bring out the interests of the man, his stability, his cooperation with others, and hopefully his inherent creativity. The interview is a two-way street. It allows the man being interviewed to evaluate his prospective employers, the working

conditions and personnel policies of the institution and the morale of employees. In so doing it helps him decide whether or not he wishes to take the position.

c) Tests. Psychological tests designed to measure general intelligence, aptitudes, personality, reasoning ability etc., are widely used to evaluate research personnel. The results of these tests do not always agree with individual ratings of the staff made by research directors. Neither does the director's rating of a man always agree with a rating of the same person by another supervisor. Each research director, in assembling his staff, places emphasis on different human characteristics but can still assemble a good laboratory staff. The use of testing is a matter of personal preference.

## 2. Training of Personnel.

a) On the Job Training. There should be a systematic attempt to train and stimulate the young research workers to develop their best qualities. Conferences with supervisors and co-workers are often a help. When the staff is sufficiently large to justify it - say fifty research employees - regular courses on the management and practice of research should be initiated. It must be recognized, however, that the ultimate performance of any individual largely depends on his inherent capacity.

b) Continuing Education. Learning is a life-long process particularly in science and technology. Formerly the subject of continuing education was left entirely to the individual. He could study technical

journals and hold active membership in professional societies. The latter were established primarily for educational purposes, to inform their members of the latest technical developments in their fields of interest. With the rapid extension of these disciplines in recent years - sometimes referred to as the scientific explosion - there has been a widespread acceptance of the fact that formal programs designed to keep the personnel up to date, are essential. Otherwise the staff will lose its effectiveness. Again when the ISIRI staff becomes large enough to justify it, specific courses of a technical nature should be conducted in the laboratory. Cooperation of the universities will be of great help in this program.

3. Program Direction. The administration of a research program contains many elements that differ from ordinary administration. Its amount and nature varies with the particular kind of research involved. The programming must be done just as realistically, but not as strictly, as for production. In the early stages of the research the programming needs considerable flexibility. As the project proceeds into the pilot plant and development stages, the planning becomes more sharply defined, approaching the scheduling for production work.

The first item to consider is the timing of the research. If it is undertaken too early, it may never be converted into production. In fact it may have to be re-discovered before it is used. Similarly if it is done too late, a competitor may have already entered the field to reap the benefits of the advance.

It takes keen judgement of the market to decide the most suitable time to begin a particular project.

In the early phases of the work, when the program is less rigid, the question necessarily arises as to which staff person directs and plans the program. Here considerable variation exists. Some research managers attempt to exercise a strong control. Others adopt a laissez-faire attitude, allowing the project directors and the workers to do most of the planning. The first procedure tends to make it difficult to get good project directors. Consequently the average usually lies closer to the laissez-faire method. In other words, the project director is given greater authority than his counterpart in industry. The reason for this is obvious. In any work involving a substantial amount of creativity, it is necessary to rely very heavily on the thinking of those who supply the ideas. While a craftsman may be given specific instructions about painting a house, it is difficult to tell an artist how to paint a mural. He has to be taken largely on faith.

This does not, however, mean that the research director has an unimportant part to play in the laboratory; in fact good direction is essential for getting good performance from the rest of the staff. Whenever a laboratory is not productive the first place to look for the failure is in that direction. Thus it seems desirable to consider briefly what the qualifications and responsibilities of a research director are.

Professional people quite generally feel that the director of research should be brilliant and an

experienced technical man with a good understanding of people. Occasionally, however, he may be the executive type without too much technical accomplishment. Along with professional qualifications, the director must be a man of great foresight, perseverance and stability. Otherwise there is little likelihood that the research of his laboratory will be pursued to a successful conclusion. He must show good judgement and fairness in dealing with his people. One of the surest ways to reduce the effectiveness of a research laboratory is for its director to show favoritism in dealing with his staff. This may appear in a number of ways such as preferential treatment, unwarranted pay increases or bonuses, or leave with expense accounts to attend conventions or visit foreign plants. The stress here is on "unwarranted".

To summarize, the principal functions of the research director are as follows:-

1. He is largely responsible for the organizational arrangements, the program and selection of staff.
2. He is the scientific advisor of the administration.
3. He acts as the liaison between other parts of the organization.
4. He guides rather than directs the work of the individual projects.

He is the most important member of the research staff. With all this responsibility, he must be able to present in a favourable way the research activities and plans

so that he will insure the financial support required to keep the program operating. The director should always be included in meetings at which major research decisions are made.

#### 4. Ratings and Reviews.

Periodic reviews or ratings of research personnel are commonly employed in large corporations. Often this rating is a composite of the opinions of several people; in other cases the man's superior rates him. The question is sometimes raised as to the value of these ratings. They are certainly not very accurate, so what do they mean? Perhaps their greatest value for the administration lies in the fact that they focus attention on the man. They concentrate on areas where he needs further training. The value to the man being reviewed is to show him that management is interested in him, and to call his attention to the impression he has created. This in turn allows him to take steps to improve his performance or image. By doing so he can contribute more effectively to his own progress and that of the organization he serves. A typical rating form has been prepared and suggested for ISIRI use, as given in Figs. 3 and 4. A rating system should be started when the professional staff on research reaches 50 employees and used at least once a year. Experience will show exactly what procedures will be best for ISIRI. Salary adjustments should also be reviewed at this time.

**FIGURE 3**

**ISIRI RATING SHEET**

for

**RESEARCH PERSONNEL**

Employee \_\_\_\_\_ Service \_\_\_\_\_ Age \_\_\_\_\_

Assignment \_\_\_\_\_ Division \_\_\_\_\_

**A. PERFORMANCE**

Relative productivity in view of his opportunities

Performance	Exceptional	Excellent	Good	Average	Fair
	10	9	8	7	6
				6	5

**B. CAPACITY FOR GROWTH**

- |                          |                                     |
|--------------------------|-------------------------------------|
| ( ) Expect Rapid Advance | ( ) Could replace direct superior   |
| ( ) Should advance       | ( ) Present work takes full ability |
| ( ) Could Handle More    | ( ) Limited to present job by age   |
| ( ) Efficiency dropping  | ( ) Merits further consideration    |
| ( ) Unsatisfactory       |                                     |

**C. ATTITUDE AND LEADERSHIP**

Executive    Supervisor    Individual worker only

Professional \_\_\_\_\_

Leadership \_\_\_\_\_

FIGURE 4.

**PERTINENT TRAITS**

Exceptional    Excellent    Good    Average    Fair    Poor  
10                    9                    8                    7                    6                    5

Knowledge of work \_\_\_\_\_

Analytical ability \_\_\_\_\_

Personal relations \_\_\_\_\_

Supervisory ability \_\_\_\_\_

Productivity \_\_\_\_\_

Initiative \_\_\_\_\_

Fiscal responsibility \_\_\_\_\_

Dependability \_\_\_\_\_

Outstanding characteristics:

Limitations:

Remarks:

Date: \_\_\_\_\_

Rated by \_\_\_\_\_



### 5. Salaries.

Administration of salaries is always an important and difficult task but in research work it is unusually difficult. This stems from the fact that there could be said to be two widely differing methods of approaching the problem. In one, jobs are rigidly described. Progress up the scale is largely predicated on length of service. This system is widely used in factories, civil service and even education. Under such an arrangement, when an employee complains about his salary he is told that he is being as well paid as some other individuals with similar training and service record. This system is apparently reasonably successful when the nature of the work is such that people will produce substantially the same amount in equivalent jobs. In research, on the other hand, the idea of relating the pay of the man to his intrinsic value to the organization is beginning to be accepted. For example, consider the impact on their employers if Zworykin, the father of television, or Carothers, the inventor of nylon, became dissatisfied with his pay, and took a job with another company, perhaps a competitor.

At one time it was customary to recognize the value of such outstanding individuals by increasing their administrative responsibilities, thereby having them advance up the administrative ladder in payment for their services. This approach has a serious defect. Very often the research genius becomes only an average administrator with a net loss to the company and frustration to the man. To avoid this difficulty

many companies have both an administrative and a research ladder of promotion. In the latter, outstanding research people are compensated in terms of their value to the organization, without regard to what the administrative people are being paid. This approach has much to commend it, but it is extremely difficult to administer.

At the present time ISIRI salaries are being administered more or less according to length of service. There is considerable dissatisfaction with the salary situation. ISIRI will never grow to be an outstanding research organization unless the current salary practices are drastically changed. Various mechanisms have been suggested to avoid the flaws of the civil service system. One of these is the direct employment of ISIRI workers by industry, as described in the Organization Section. Another is for ISIRI to employ temporary staff by contract, to work on specific research problems. Either method would take the salary scales out from under civil service. Such approaches have some merit but do not really solve the salary problem. In Appendix D it is noted that the Plan Organization has found another more satisfactory method of dealing with the salaries of its staff; it has been freed from the Civil Service Code without subterfuge.

#### E. Aids for Personnel

##### 1. Technical Information.

Since the progress of a developing nation depends

in large part on the ability to assimilate known world technology, a good documentation center and technical library are an absolute necessity in a research laboratory. The library at ISIRI is fair but a much better one is needed. A proposal for one was submitted to UNESCO by the ISIRI Management. Implementation of this project was delayed due to lack of funds but it is now being started. It will have a very beneficial effect on industrial research. It will, however, have to be supplemented from other sources.

Those industries which have been established with the cooperation of companies or organizations of the industrialized nations will bring in technology directly. Small business is another matter. If it is a native industry some technology has been developed; it requires, perhaps, only some modernization. On the other hand, if the technology is imported but must be used by Iranian businesses with no foreign contacts, a problem exists. The information needed is generally not available in a science or technology library. UNAIR has brought in such information for several areas. Here are a few examples:-

<u>Technology</u>	<u>Information sources</u>
1. Manufacture of small automobile parts	1. S.A.E. Handbook.
2. House Wiring	2. Sears Roebuck and Montgomery Ward Manuals.
3. Radiation of food	3. A small reference library from U.S.Army Natick Laboratory

Technology

Information Sources.

- |                                      |                                  |
|--------------------------------------|----------------------------------|
| 4. Asphalt highways                  | 4. Manual of U.S. Army Engineers |
| 5. Sugar beet wastes                 | 5. U.S. Library of Congress      |
| 6. Earthquake resistant construction | 6. University of Illinois U.S.A. |

Some continuing source of low cost of such simple technology should be provided for developing countries. An approach has been made to several sources to determine if such material can be made available.

2. Manuals

Due to the special nature of research, with its constant meeting of new problems, large laboratories have found that personnel manuals are of great help. Before coming to Iran UNAIR collected a number of employee's manuals from institutions and industrial laboratories in the United States. He planned to use them as guides in the preparation of a research personnel manual for ISIRI. Study of these with his counterpart led to the selection of the Mellon Institute of Industrial Research manual as most closely fitting the needs of ISIRI. It was translated into Farsi so that it could be studied by members of the laboratory. Consultation could then determine how it should be modified to apply to ISIRI requirements. At this point it was taken over by the administration division of ISIRI as its responsibility. UNAIR recommends that this be returned to the industrial research division where a better understanding of the problems exists.

Dr. L.W. Bass has prepared a manual for the evaluation of research institutes in developing countries which UNAIK was asked by UNIDO to review. This manual details in excellent fashion the management techniques used for research, and shows how to rate a laboratory. It should be of great value to those responsible for directing research institutes. Many of the procedures outlined can be immediately applied to ISIRI. Others will become applicable as ISIRI grows and needs more refined techniques.

## VIII FACILITIES

### A. Buildings:

The industrial research laboratories are comfortably housed in Karadj. It is only forty kilometers west of Teheran but the climate is more pleasant. There is ample room for the expansion of the laboratories that will inevitably take place in the next fifteen or twenty years, without disruption and cost of moving to another location. There is staff housing available near the laboratories which could be increased. The staff living in Teheran is brought by bus to Karadj.

When a really good documentation center is installed at ISIRI this would be an incentive to build a research complex in Karadj. There are several other ministries that should have laboratories, and this area might attract them.

B. Equipment.

The laboratories are well equipped. It is characteristic of all laboratories, however, to want more and more equipment, and ISIRI is no exception. Such requirements are expensive. If the development of a research center at Karadj should become a reality, expensive sophisticated equipment could be shared by several institutions. Similarly the equipment section, (with its construction and repair facilities), of the Metrology Center could be used by other laboratories to the benefit of all.

Furthermore, the influx of new families would make possible the improvement of schooling in the area. This is a serious deficiency at present, and the reason many staff members choose to commute from Teheran.

IX. SERVICES.

In order to obtain efficient performance from professional personnel it is essential that they have good supporting services. The status of these services at ISIRI, when first examined by UNAIR was far from satisfactory. This was due in part to the newness of the program. The technical service deficiencies were generally acknowledged and steps are being taken to correct them.

The documentation center and the Metrology center which also contains provision for equipment construction and maintenance are good examples. Pilot plants and techno-economic studies have also put in an appearance.

The non-technical services present a mixed picture. There has been good progress in supplying telephones, transportation and building service, but this subject needs further review.

Some service activities contain an element of control. These include accounting, purchasing, legal matters and the like. At ISIRI, and perhaps in Iran in general, there seems to be greater emphasis on the control rather than the service function - at least that is the way it appears to UNAIR. No doubt there are conditions in the local situation that explain this. Nevertheless, UNAIR feels compelled to point out the great benefits to be obtained from increasing the service function and recognizing that standards and research constitute the purpose for which the Institute was established.

In studying the research at ISIRI, UNAIR has attempted to sort out the problems and then try to solve them in an orderly way. The direction and organization of the work was considered the primary problem and was attacked first. Personnel is the second item being worked on and it involves two phases. One is the procurement of the research personnel and the second is furnishing them with good working conditions. The selection of personnel is now being given major attention and it is trusted this will eventually be resolved. The supporting services have not yet received major attention but they constitute a very serious problem. Questions such

as these should be resolved:-

1. Are the costs for these services reasonable ?
2. Do these services adequately support the productive activities of the laboratory such as standards, research and testing ?
3. Is it wise to have control and operational activities in the same department ?

The first two questions are self-evident but the third requires some comment. Earlier in this report the fixing of testing and research was discussed and a separation was advised. A somewhat similar situation exists in the Administration Division. Since this division plays a large part in the distribution of funds there is a danger that the operating section of the division will be favored in financial matters. The division should be asked to review and report on this situation. If they cannot justify the current condition, a management consultant in business administration should be asked to study and advise what should be done.

#### A. Accounting.

This service has been a source of much criticism by the staff. Some employees suffer undue delay, (many months) in getting their pay and expense account checks. Until this sort of thing is corrected and the rights and dignity of the employee are respected, the country has little justification in complaining of the "brain-drain".



One phase of accounting that needs perfecting is the pricing of the work of the laboratory. This becomes more important as the extent of the research work increases. Ordinarily the charge for research includes direct costs, indirect costs and profits. The first is a matter-of-fact and the last is a matter of policy. It is in determining the indirect costs, or overhead, that the greatest difficulties arise. They represent a real cost of conducting business yet are difficult to assign directly to a given project. They can be added together and the total is figured as a percentage of the direct charges. This percentage is added to the other charges to arrive at the total cost of the work. The items which may be included in the indirect charges are these:-

1. Salaries in the Director's office, the accounting office, the public relations office and of workers between projects.
2. Laboratory equipment and tools, office equipment and supplies, building and grounds maintenance, alteration, repairs and depreciation.
3. Employee benefits, such as health and safety, and pensions.
4. Travel, printing, postage.
5. Vehicle operation and miscellaneous plant charges.

Conditions in Iran will require modification of the list. It is given to show the nature of the problem, not its detail.

B. Purchasing.

This has been another trouble spot. In one instance it took three months and twenty-six signatures to permit the purchasing of a rather simple piece of laboratory equipment. This unfortunately is typical. An effort to improve the situation is being made and will no doubt, eventually be successful.

C. Legal Services.

The legal relationships in research are somewhat different from those in other business relationships and require special attention. A few of the types of contract that could be encountered are as follows:-

1. Contracts between the research laboratories and industry, government agencies or universities.
2. Contracts with employees.
3. Patent agreements with employees.

As a specific example, a contract with an industrial sponsor might well include the following items:-

1. Work statement; 2. publications; 3. publicity;
4. patents; 5. basis of cost; 6. supplementary agreement required by the contract; 7. billing;
8. renewal or continuation; 9. property;
10. completion; 11. inventor's agreement;
12. title; 13. reports; 14. proposal limitations.

The whole subject of legal problems should be reviewed in detail by the Research Management Committee. The ISIRI lawyer, at the appropriate time should consult the Director of Industrial Research to ensure that in the future suitable contracts are prepared.

## X LONG RANGE PLANNING

In Fig. 2 was given a five-year plan for the ISIIRI Industrial Research Laboratories. To accomplish this proposed plan there are certain problems and precautions, which will be discussed under the following headings.

### A. Organization.

UNDAI has taken the position that industrial research can be successfully conducted as a part of ISIIRI; many others would recommend that the standards and research work be separated into independent institutes. This is predicated on three assumptions. One is that the management at the Director-General level recognizes the special needs of the research and protects it from being smothered by the larger standards operations. The second is that the director of industrial research be continued and encouraged in his present position or, if in the event that he should leave, that he be replaced by someone of equal technical competency and stature. The third is that the administrative and service activities be studied and revised to ensure that they give better support to the standards and research work.

In the event that the above conditions cannot be met then a separate institute must be set up.

### B. Program.

The finding of worthwhile program items has presented no difficulty. Many of the subjects for future investigation are already under consideration.

and they have been suggested to ISIHI by many sources.

Some prospective projects on which work was done prior to 1968 remain to be salvaged or reevaluated. These include a. carbon, active and inactive; b. plastics; c. process metallurgy; d. textiles (cottage industry); e. sugar by-products; f. bleaching agents; g. rice bran oil; h. date juice; i. vegetable extracts in addition to carpet dyes.

Another group of possible projects which has been assembled more recently is listed below:-

a. Automobiles. The automobile industry of Iran has plans that will make it one of the major segments of the Iranian economy. ISIHI is already working, at the request of the Iran National Company, on the standards for components. Concurrent with this research is needed to maintain quality and adapt the designs of western origin to meet Iranian conditions. One project on batteries has already been completed. Safety is a problem of particular interest. A background is now being collected of existing world technology for use at the appropriate time.

b. Petrochemicals. A petrochemical industry based on foreign technology is currently being established in Iran and this will eventually require research. ISIHI has sent representatives to visit these new plants and is considering using foreign consulting advice to help crystallize a course of action. Petrochemical research is of course, a prime responsibility of the Research Laboratories of the National Iranian

Oil Company. ISIRI cooperation has been offered to NIOC and the latter is interested. It has been tentatively suggested by the latter that ISIRI start a research program to determine the suitability of Iranian plastics for the manufacture of various industrial products.

c. Thread. Iranian thread does not equal in uniformity and other physical properties that produced in some other countries. Various threads of different manufacture have been tested and bear this out. Research is needed in this field.

d. Sugar. There are twenty-six sugar factories in Iran, all facing problems. It has been suggested that a sugar research institute be established to help solve their difficulties. This is being investigated to determine if ISIRI can help. Discussions have been started with this industry and will probably be well along by the time this report is published.

e. Housing. This is a complex problem involving materials, design, cost, safety, standards and health factors. While the Ministry of Housing has primary interest in this area, ISIRI is also concerned with it. Some research work has already been done on building materials and this will be expanded.

f. Air and Water Pollution. Iran's rapid industrialization is heading toward major difficulties in this area. A background of knowledge is being developed to direct ISIRI research toward worthwhile objectives.

g. Structures. Large buildings and structures in Iran use materials and designs different from those found in other areas. Study is needed to determine if improvements can and should be made in local practices.

h. Cosmetics Cosmetics is providing an attractive and profitable business in Iran. If the possibility of generating a strong export trade also exists, this is worth exploiting and requires some adaptive research.

i. Systems Analysis. Systems analysis is a popular activity and is often suggested as a method of solving problems in developing countries. Such analysis is not a new concept, but the availability of computers to make the work more effective, is new. Such techniques will no doubt find use in the steel industry, the oil industry, the communications system and other complex operations. ISIRI should be alert to capitalize on any opportunities to help Iranian industry to take advantage of this aid.

j. Technological Assessment. In industrialized countries an activity known as technological assessment is beginning to attract attention. In an attempt to predict at an early stage what the effect of new technology will be - both good and bad - on the health, welfare and economy of the country, and allow for corrective action.

k. Quality Control. As Iranian industry grows there will be a need for sophisticated quality control.

ISIRI could well serve as a focal point for the development of research activities in this important area.

1. Shoes. Iran has become a large manufacturer and exporter of shoes. ISIRI has been asked to extend its activities to include leather. Increased interest in the manufacture of shoes and other leather goods is to be anticipated.

2. Concrete Bars. The use of reinforced concrete construction is being favored in Iran because it utilizes more native raw materials than steel frame construction. There has been some difficulty with the properties of the reinforcing bar. An evaluation of the problem will be made, followed by a study to determine the necessary corrections to improve the quality.

3. Oil. Discussions are going on with the Research Laboratory of the National Iranian Oil Company in a search for areas of cooperation. At the moment it appears that some sort of cooperative venture will be started having to do with bitumen for roads.

4. Standard Sand. Civil engineering research workers are finding a need for standard sand for concrete research programs. ISIRI may well accept the assignment to develop this.

This list should in no way be considered an official commitment. It is a collection that UNAIR has put together on the basis of his discussions of the national needs and the CSIR laboratory capabilities. Items will be added or deleted as these factors change. It is important, in order to keep a research program working to capacity, to investigate as many potential subjects as possible well in advance of their implementation.

C. Personnel.

To recapitulate the comments in the preceding pages about personnel, particularly as they apply to future planning:-

1. Upgrade the quality of the staff
2. Pay better salaries
3. Treat all staff equitably and fairly.
4. Eliminate the unproductive members.

XI RESEARCH POLICY.

There have been innumerable discussions and publications about research policy and science. Much of it has been directed toward developing nations. UNAIR has submitted one more contribution to this list, at the request of UNIDO "Research and Development News". The essential points in this article, entitled "A Suggested Research Policy for a Developing Country", are:-

- A. Industrialization of a country should be treated as a national emergency, with concentration



of resources on the objective.

B. A stepwise progression of research is required, always properly integrated with industry.

C. At first technology is borrowed from world knowledge and adapted to meet local needs.

D. Then new knowledge is produced by applied research.

E. Finally, when the industry is mature, basic research is undertaken to contribute to world knowledge.

**XII** SUMMARY:

1. The administration of ISIRI asked the United Nations for an adviser to reassess its program on industrial research.

2. After a study of the organization and its activities, the Adviser recommended that the direction of the research must be strengthened; the research must be separated from the testing work; formal methods for selecting projects and reporting progress must be established.

3. A five-year program plan was adopted, starting with five projects in the fall of 1968. These were simple and tailored to the needs of the country. At the end of 1969 the operation of the program fell one project behind the plan for thirteen, with two completed, two almost completed and eight under study.

4. A nucleus of good personnel for research existed at ISIRI. The staff was evaluated, reassigned and counselled. Personnel employment practices still need improvement. Services and facilities, to promote research personnel efficiency, must be made better.

5. Cooperation with universities, industry and Government institutes was expanded.

6. Long range planning for future growth and expansion was outlined.

# APPENDIX . A

## SECTION 1

Chemistry			
Laboratories	Org Chem	Inog Chem	Phys Chem
Number of Experts	2	2	3
Number of Technicians	3	4	1
Name	Khalilian	Bassiri	Siasi
Acad degree	M S	B S	B S
From	Teheran Uni	Teheran Uni	Teheran Polytech
Employed in ISIRI	4 Years	4 Years	2 Years
Experience in IRAN	3 "	10 "	10 "
" in	5 " in Germany	—	5 " in France
Age	34 "	37 Years	40 "
Name	Keshavarzi	Tavakkol	Fardin
Acad degree	M S	B S	B S
From	Teheran Uni	Teheran Uni	Teheran Polytech
Employed in ISIRI	3 Years	2 Months	1 Years
Experience in IRAN	2 "	16 Years	13 "
" in	2 " in Germany	—	—
Age	34 "	38 Years	37 Years

SECTION 2

Profess  
of IS

Chem	Textile	Wool and Dyeing	Leather	Dried fruit
	2	2	1	3
	2	2	1	—
	Semsar M S Teheran Polytech 3 $\frac{1}{2}$ Years — — 32 Years	Mrs. Sooresafil M S in Textile Teheran Polytech 3 Years — — 27 Years	Asgarian 4 Years 2 " 35 Years	Kohanim B S in Agr Eng USA(Fresno state colleg <sup>e</sup> ) 3 Years 42 Years
	Rezaei M S Teheran Polytech 3 $\frac{1}{2}$ Years — — 29 Years			Georgian B S in Agr Tabriz Uni 4 Years 6 " — 35 Years
				Miss Hadjianpour

# Professional Personnel of ISIRI'S Laboratories

SECTION 3

	Cereals	Mechanical	Glass	Metallurgical	Bi...
	1	2	—	—	
	—	4	—	—	
AgrEng State college 35 years	Baghai M S in Agr Teheran Uni 1 Years 10 " — 35 Years	Guity Peyma M S Germany 3 Years — — 37 Years			Am B US 2
Agr Uni		Balali B S England 4 Months — — 26 Years			
anpour					

SECTION 4

Guiding Instruction	Ceramic	Electrical
1	2	2
9	2	2
Mirsoleymani B.S. Ph.D SA. England 2 1/2 Years  30 Years	Mir Haroun B.S in Chemistry Teheran Uni 4 Years 9 " " 1 " in Lebanon 37 "	Sami B.Sc(ENG)ACGI England 2 1/2 Years 3 " " 1 " England 29 "
	Mohadjerin B.S in Geology Teheran Uni 4 Years 10 " " — 37 Years	Etminan M.S Teheran Polytech 2 1/2 Years 5 Months 9 " France 29 Years

Laboratories	Org. Chem	Inog. Chem	Phys Chem
Number of Experts	2	2	3
Number of Technicians	3	4	1
Name	Khalilian	Bassiri	Siasi
Acad degree	M . S	B . S	B . S
From	Teheran Uni	Teheran Uni	Teheran Polytech
Employed in ISIRI	4 Years	4 Years	2 Years
Experience in IRAN	3 "	10 "	10 "
" in	5 " in Germany	—	5 " in France
Age	34 "	37 Years	40 "
Name	Keshavarzi	Tavakkol	Fardin
Acad degree	M . S	B . S	B . S
From	Teheran Uni	Teheran Uni	Teheran Polytech
Employed in ISIRI	3 Years	2 Months	1 Years
Experience in IRAN	2 "	16 Years	13 "
" in	2 " in Germany	—	—
Age	34 "	38 Years	37 Years
Name	R Rahnema		Miss Azad
Acad degree	B . S , M . S		B . S
From	Teheran Uni Peabody U.S.A		Teheran Uni
Employed in ISIRI	1 Month		2½ Years
Experience in IRAN	—		—
" in	U . S . A . & Singapor		—
Age	38 Years		24 Years

SECTION 5

Item	Textile	Wool and Dyeing	Leather	Dried fruit
	2	2	1	3
	2	2	1	—
<p>Semsar M S Teheran Polytech 3 1/2 Years — — 32 Years</p>	<p>Mrs. Sooresafil M S in Textile Teheran Polytech 3 Years — — 27 Years</p>	<p>Asgarian  4 Years 2 "  35 Years</p>	<p>Kohanim B S in Agr USA(Fresno state) 3 Years   42 Years</p>	
<p>Rezai M S Teheran Polytech 3 1/2 Years — — 29 Years</p>			<p>Georgian B S in Agr Tabriz Uni 4 Years 6 " — 35 Years</p>	
<p>ad  Uni ars  ars</p>			<p>Miss Hadjianpou Veterinary Doct Teheran U 2 Months 3 Years — 28 Years</p>	

SECTION 6



	Cereals	Mechanical	Glass	Metallurgical	Building
--	---------	------------	-------	---------------	----------

--	--	--	--	--	--

	1	2	—	—	
	—	4	—	—	

--	--	--	--	--	--

Engineering (leg)	Baghai M S in Agr Teheran Uni 1 Years 10 " — 35 Years	Guity-Peyma M S Germany 3 Years — — 37 Years			American B US 2 3
----------------------	---	--	--	--	-------------------------------

--	--	--	--	--	--

		Balali B S England 4 Months — — 26 Years			
--	--	--	--	--	--

--	--	--	--	--	--

--	--	--	--	--	--

SECTION 7

Building & construction	Ceramic	Electrical
-------------------------	---------	------------

1	2	2
9	2	2

Amirsoleymani B S Ph D USA England 2½ Years — — 30 Years	Mir Haroun B S in Chemistry Teheran Uni 4 Years 9 " 1 " in Lebanon 37 "	Sami B Sc(ENGIACGI) England 2½ Years 3 " 1 " England 29 "
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	Mohadjerin B.S in Geology Teheran Uni 4 Years 10 " — 37 Years	Etminan M S Teheran Polytech 2½ Years 5 Months 9 " France 29 Years
--	---	--

SECTION 8

		Mussavi Dipl.Chem Dr rer Nat Germany 4 Years 4 " 1 " Germany 41 "
--	--	---

APPENDIX

ANGLICAN UNIVERSITY DEPARTMENT

1961-1962 (1.1.1962)

<u>NAME</u>	<u>SUBJECT</u>
1. M. Zalani	Chemical Engineering
2. A. Sangi	Electrical Equipment
3. S. Masah	Electrical Connections
4. Shahbazi	Hydraulics
5. M. H.	Mechanical Engineering
6. Foussi	Welding
7. Hiteezid	Foundry
8. Gregorian	Civil Engineering.

## APPENDIX

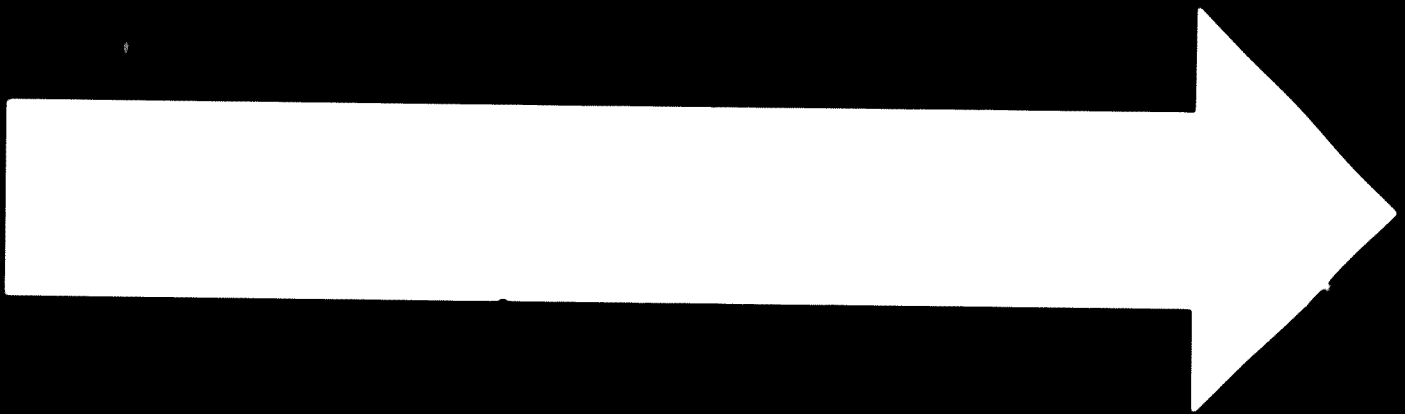
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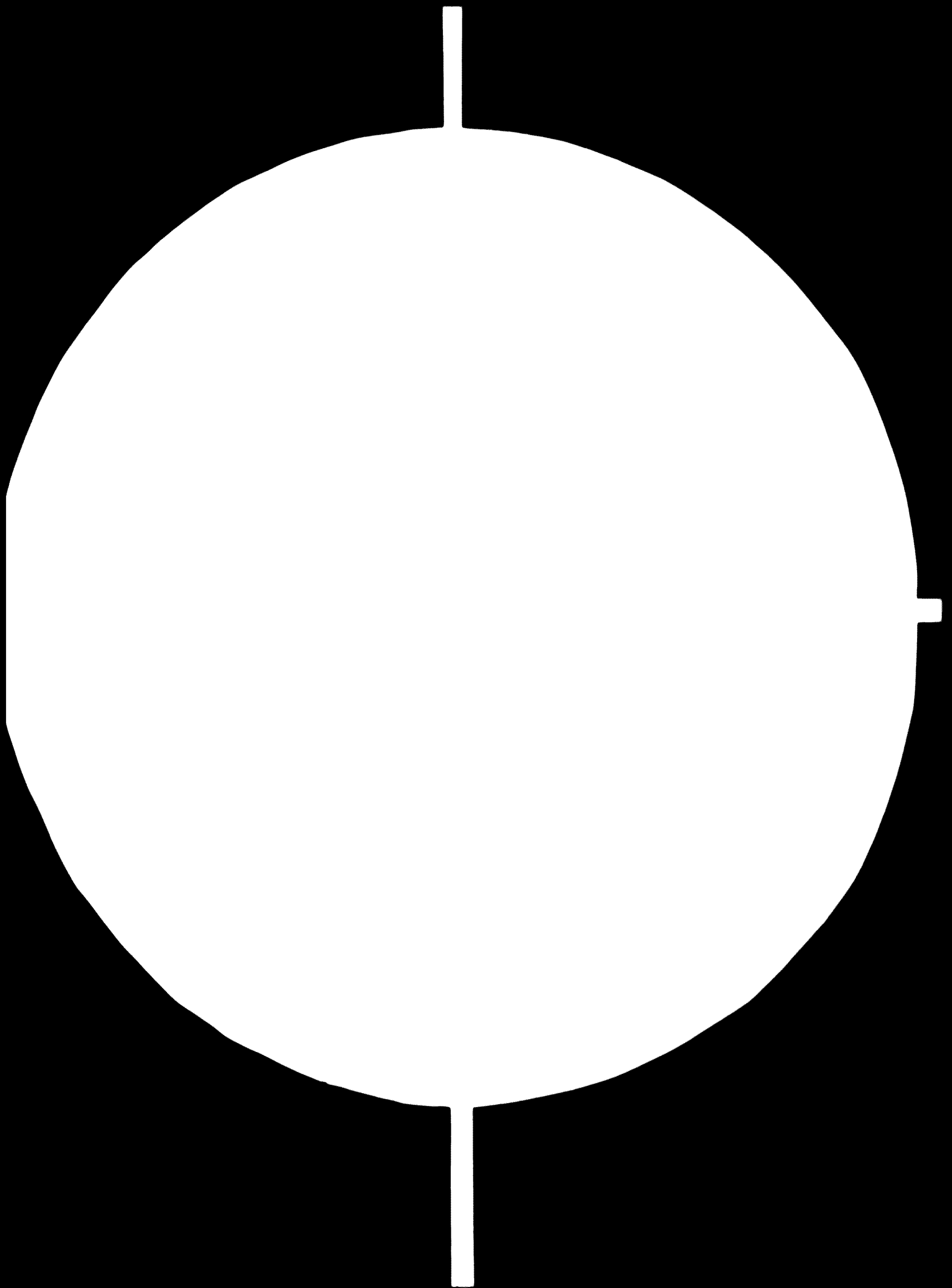
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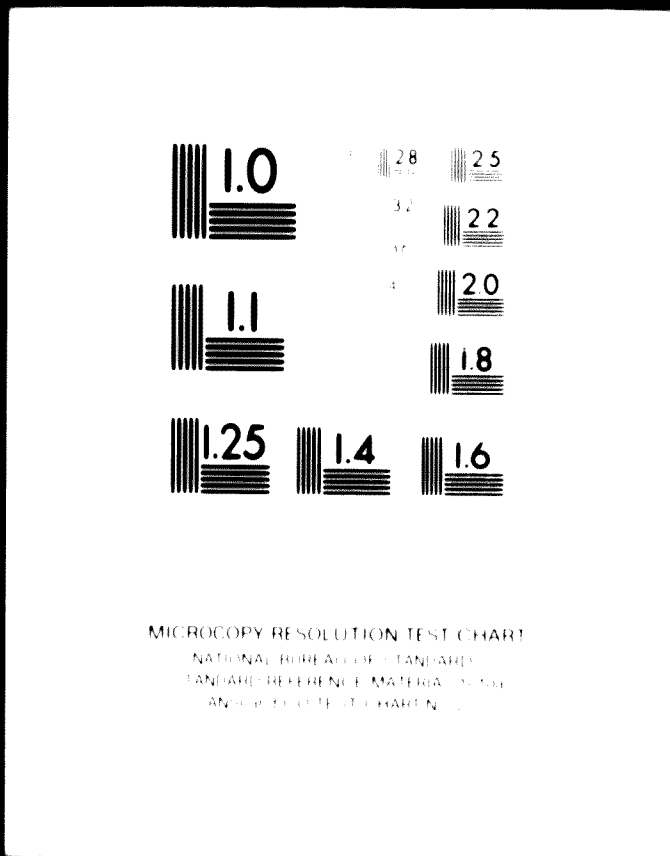
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Summary of cost elements.

## APPENDIX B

### Plan Organization Freed From Civil Service Code\*

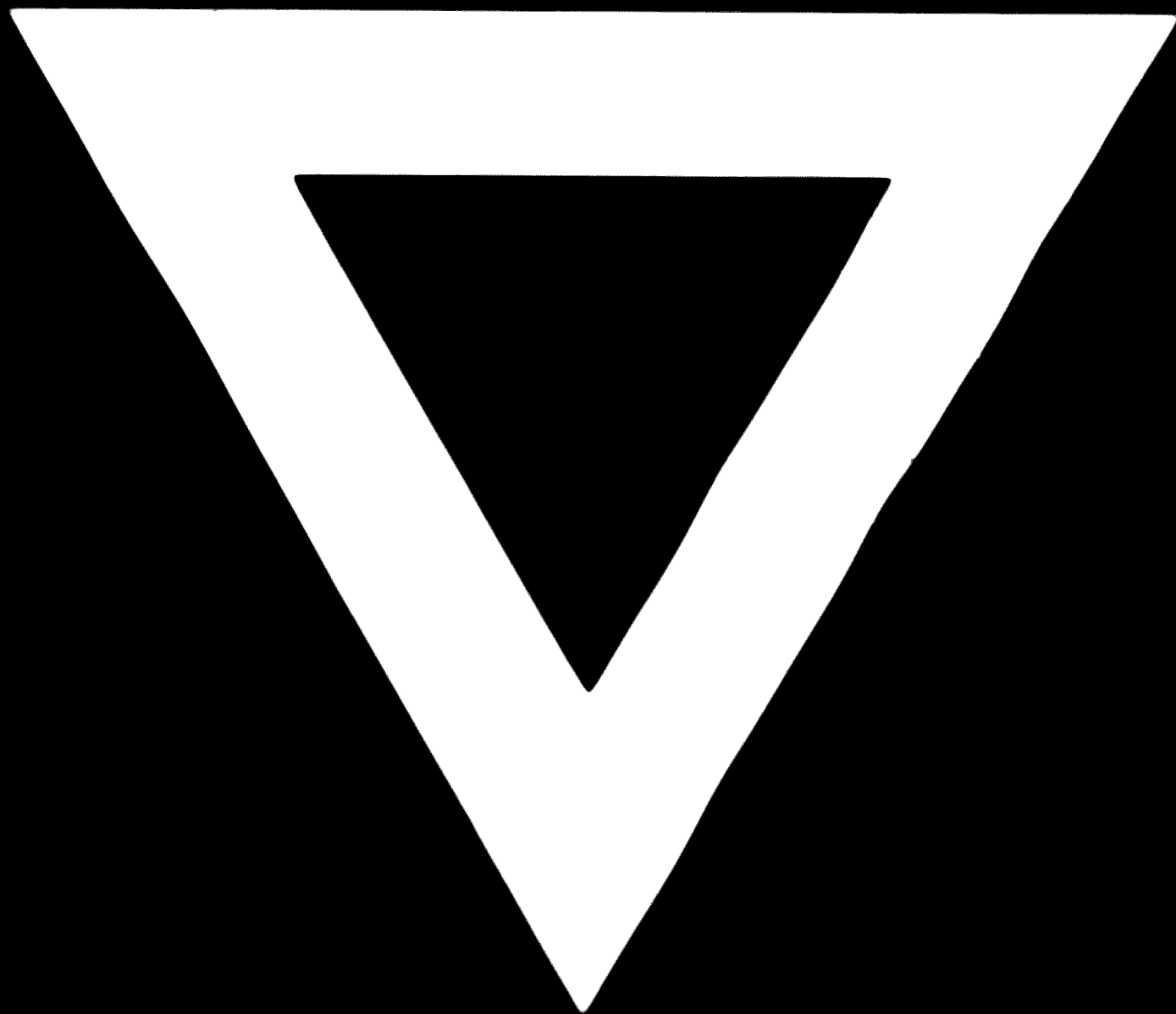
"The Majlis Planning Committee Tuesday approved a Bill which will free the Plan Organization from the restrictions of the Civil Service Code, which will allow it to hire staff without the permission of the Ministry of Finance, and pay them whatever rates it deems fit.

The Permanent Organization Bill also places the Plan Organization under the supervision of a committee headed by Prime Minister Hoveyda. Also on the committee will be ten other members including the Ministers of Finance, and Economy, a former Plan Organization Chief to be appointed by the Premier or current Chief, four senior economic experts and three Plan Organization officials including its Managing Director.

The employment and administrative regulations of the organization must be approved by the committee."

\*There are indications that such procedures will be extended into other areas.

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