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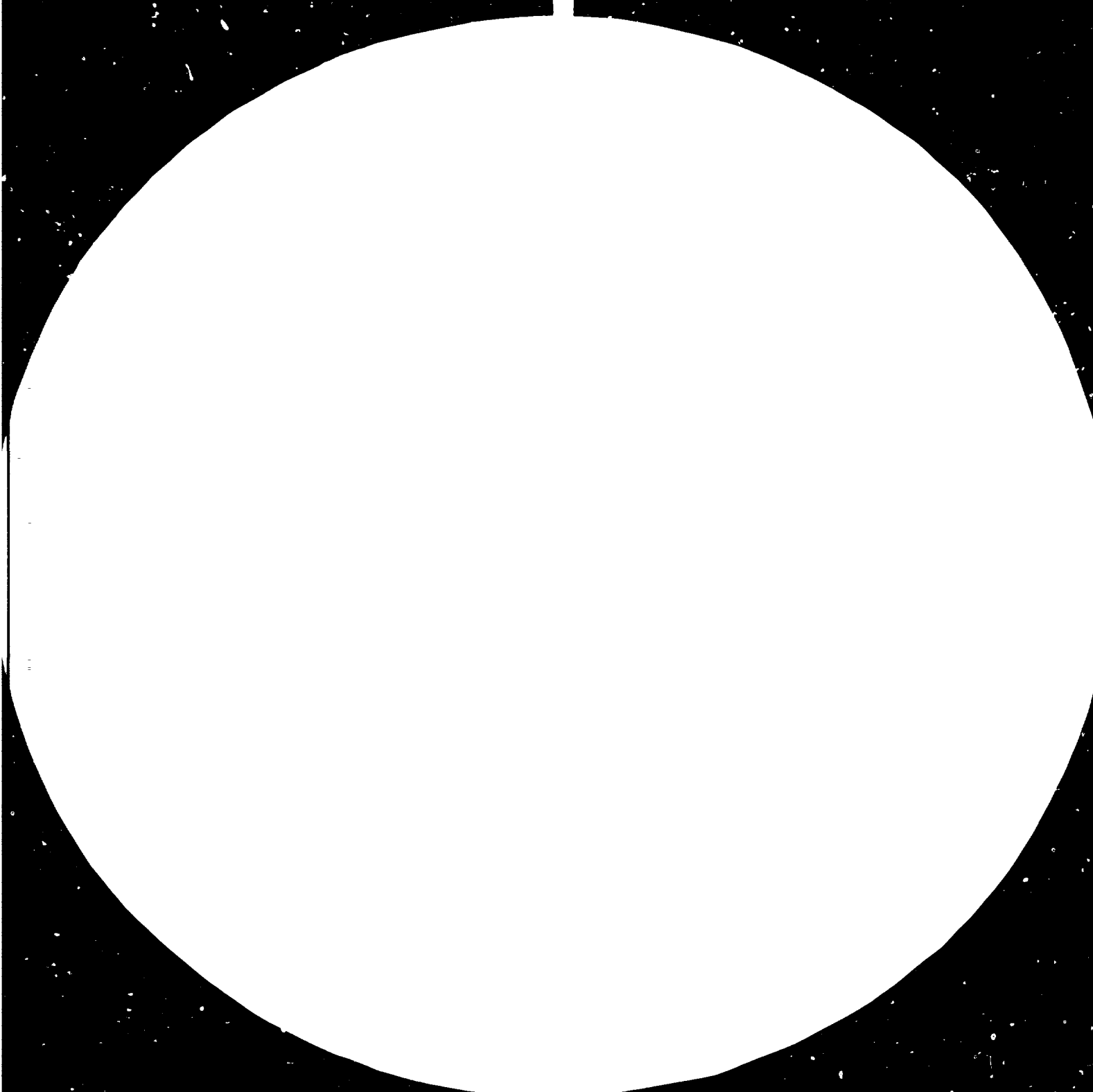
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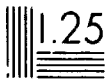
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CO-OPERATION AMONG ISLAMIC COUNTRIES, IN  
TECHNOLOGICAL DEVELOPMENT AND TRANSFER OF TECHNOLOGY AND  
IN INDUSTRIAL TRAINING.

PART I

Technological development and transfer of technology \*\*

Prepared by  
the secretariat of UNIDO

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## SUMMARY

Technological development is a dynamic factor pulling forces not only for industrial development but over-all economic progress for any country and particularly for developing countries, the group to which all Islamic countries belong. Technological co-operation can therefore play an extremely important role in the process of accelerated industrial and economic development of the Islamic Countries.

From among sectors of industry of significant co-operation potential, the following should be particularly mentioned: iron and steel, fertilizer and petrochemicals, textiles, food processing and agricultural machinery. This is so due firstly to significant natural and mineral resources, secondly to existing R and D base and thirdly to available and potential manpower base.

It should be also mentioned that in terms of industrial and technological R and D facilities Islamic countries are lagging behind industrialized countries. The situation is even worse as regards the available skilled R and D manpower. Taking, however, into account existing industrial, R and D potential and available natural and mineral resources, the following areas for co-operation in technological development have been identified in a preliminary manner:

- (a) pooling of financial and manpower resources to solve the most critical technological problems of the countries concerned;
- (b) joint programme for extension of manpower required for technological R and D;
- (c) identification of teaching R and D centres for the purpose of establishing sub-regional technological centres of excellence in selected industrial sectors;
- (d) establishment of joint general guidelines for the development of technological policies at the country level;
- (e) creation of an Islamic Technological Fund to finance certain R and D activities;
- (f) collective position vis-a-vis foreign suppliers when importing crucial technology of interest to a certain group of countries;
- (g) increased bilateral and multilateral technological co-operation among interested individual countries and their industrial R and D institution;
- (h) joint development of selected technologies for meeting basic human needs.

## I. Introduction

Technological research and development are indispensable attributes for rapid economic and particularly industrial development required at present by any country and specifically important to developing countries wishing to reach a higher level of industrialization.

The present pattern of technological development and transfer is such that it greatly favours industrialized countries in terms of existing technological research and development facilities, available personnel and financial resources as well as possibilities for application of research and development results directly at the production (and industrial) level.

This situation has its roots in the social, economic and industrial development of the so-called industrialized and developing worlds in the past 200 years and should be changed in favour of the majority of human beings living in the developing countries in order to achieve a harmonious growth of the world economy.

A number of international gatherings and conferences took up the issue of distribution of wealth among countries in the whole world and discussed at great length ways and means of changing current development trends in favour of the Third World. At the Second General Conference of UNIDO held in Lima in 1975 it was agreed that by the year 2000 the share of developing countries in world industrial production should reach the level of 25%. The achievement of the above-mentioned 25% share - the so-called Lima Target - will require a tremendous effort on the part of developing countries as well as the co-operation of the world community as a whole; as it was discussed reviewing those targets of the Third General Conference at UNIDO held in New Delhi in January 1980.

A special place among the measures to be undertaken to achieve this target should be reserved to technological co-operation among developing countries, inter alia, through pooling their limited resources.

By virtue of their position, the Islamic countries have a

significant role to play in the process of industrialization of the developing world, and technological co-operation among them is therefore of paramount importance.

In geographic terms, they spread from the extreme western part of Africa to the eastern part of Asia and from the Balkans to the equator, covering significant parts of the African and Asian continents. This spread reflects also a variety of mineral and natural resources, different races and very different levels of overall economic development.

Of the 43 member-countries 23 are located in Africa, 13 in Western Asia, 6 in Asia and the Far-East and 1 in Europe and as such are members of four different United Nations Regional Commissions (ECA, ECWA, ESCAP and ECE). Nineteen member states belong to the Arab League which also, inter alia, include membership of the Industrial Development Corporation of Arab States (IDCAS), the Arab League Educational, Cultural and Social Organization (ALESCO). Three member-states (Turkey, Iran and Pakistan) have concluded an agreement of co-operation (RCD), while most or all the members are also represented in several regional and sub-regional groupings, which are not exclusively Islamic (e. g. AFRAN, OCAM).

On the other hand, the existence of the different geographical sub-groupings favours the establishment of co-operation schemes among neighbouring Islamic countries with relatively easy access to each other and certain environmental similarities.

There appears, however, a significant potential for co-operation between member states, as the following classification can be made:

- (a) countries with a relatively developed industrial infrastructure but with inadequate resources;
- (b) countries with a relatively developed industrial infrastructure and financial resources;
- (c) countries without a sufficient industrial infrastructure and also inadequate financial resources;
- (d) countries without a sufficient industrial infrastructure but with financial resources.

Existing institutions for economic as well as political co-operation



to which some of the Islamic countries belong, e. g. the Arab League or ASEAN, should be considered as a main framework for the development effort in view of the additional inputs and stimulants to be derived from co-operative arrangements among a large number of the Islamic countries. In order for technological co-operation to be effective, however, the areas of co-operation have to be clearly defined and suitable conditions have to be created for their implementation.

This paper will give a short review of the industrial and technological base of the Islamic countries - on the basis of data available at UNIDO - and attempt to identify co-operative arrangements of specific interest to the Islamic countries.

## II. Some basic considerations as to the industrial and technological base of Islamic countries

A short analysis of the information contained in Table 2 showing the share of industrial production in total GDP, enables us to draw some general conclusions as to the importance of industry and its mining and manufacturing branches in the economic development of the Islamic countries.

The share of manufacturing in total GDP ranges from 42% in Bahrain and 19% in Turkey, to nil in Oman. Mining, by contrast, plays a more important role ranging from 78% of GDP in Saudi Arabia and 69% and 68% in Kuwait and Oman respectively down to zero share in Cameroon, Gambia and Sudan.

Analysis of the above-mentioned figures indicates heavy dependence of the Islamic countries on mining operations, particularly of those producing petroleum, and a relatively low level of development of the manufacturing industry which is at the early stages of its development in most Islamic countries.

Another important consideration may be the shares in total manufacturing value added as reproduced below:

Table 1: Major industrial sectors in selected Islamic countries in 1970, with shares in total manufacturing value added (%)<sup>a/</sup> -

<u>Country</u>	<u>Major Sector (with share in MVA)</u>
Cameroon	Food (30), non-ferrous basic metals (13), beverages (12);
Egypt	Textiles (32), food (10);
Libyan Arab	Tobacco products (44), food (14), other chemical products (11);
Somalia	Food (89);
Sudan	Textiles and clothing (27), food (21), beverages (12);
Tunisia	Food (19), industrial and other chemical products (12).

<sup>a/</sup> Major sectors defined as account for at least 10% of the total MVA.  
Source: Industrial Technology in Africa; UNIDO ID/WG.332/6

Table 2: Share of Main Sectors in Total GDP (per cent) 1978

<u>Country</u>	<u>Agriculture</u>	<u>Mining</u>	<u>Manufacturing</u>
1. Afghanistan <sup>1/</sup>	57.7	7.9	11.3
2. Algeria <sup>1/</sup>	8.5	26.7	12.8
3. Bahrain	..	..	..
4. Bangladesh	52.2	0.0	6.9
5. Cameroon	32.3	1.1	9.3
6. Chad <sup>1/</sup>	42.1	1.0	9.9
7. Comoro Islands <sup>1/</sup>	47.9	-	8.9
8. Djibuti	..	..	..
9. Egypt <sup>1/</sup>	30.9	3.3	13.8
10. Gabon	5.8	34.5	5.4
11. Gambia <sup>1/</sup>	58.3	0.3	1.5
12. Guinea	21.3	22.3	6.8
13. Guinea Bissau <sup>1/</sup>	62.5	-	0.7
14. Indonesia	30.5	17.6	9.9
15. Iran <sup>1/</sup>	9.0	30.7	11.8
16. Iraq <sup>1/</sup>	6.2	55.9	7.4
17. Jordan	9.0	4.0	10.8
18. Tanzania	48.0	0.4	8.3
19. Saudi Arabia <sup>1/</sup>	0.9	74.8	5.0
20. Kuwait <sup>1/</sup>	0.2	60.2	5.4
21. Lebanon <sup>2/</sup>	8.5	-----	13.0-----
22. Libya	2.0	54.4	2.6
23. Malaysia <sup>1/</sup>	27.3	5.3	17.0
24. Maldives	..	..	..
25. Mali <sup>1/</sup>	37.7	-	13.5

	<u>Country</u>	<u>Agriculture</u>	<u>Mining</u>	<u>Manufacturing</u>
26.	Mauritania	25.0	12.1	5.7
27.	Niger <sup>1/</sup>	53.2	6.9	6.5
28.	Oman	3.0	55.8	1.2
29.	Pakistan	29.2	0.8	14.4
30.	Qatar	..	..	..
31.	Senegal	23.4	-----	19.8-----
32.	Sierra Leone	34.2	11.7	7.6
33.	Somalia	32.2	5.4	9.6
34.	Sudan <sup>1/</sup>	36.5	0.7	6.7
35.	Syria	19.8	9.0	10.8
36.	Tunisia	15.6	6.9	10.0
37.	Turkey <sup>1/</sup>	25.3	1.0	18.9
38.	Uganda <sup>1/</sup>	74.4	0.2	4.7
39.	U A E	0.9	57.2	4.5
40.	Upper Volta <sup>1/</sup>	45.8	0.1	9.8
41.	Yemen, A. R. <sup>3/</sup>	40.6	1.0	5.3
42.	Yemen, P. D. R. <sup>2/</sup>	17.4	0.2	12.3
43.	P L O	..	..	..

Source: For 1978 - UN, Monthly Bulletin of Statistics, November 1980  
<sup>1/</sup> - U N S O; 1977  
<sup>2/</sup> - Statistical Abstract of the Region of the ECWA, 1980; 1977  
<sup>3/</sup> - Statistical Abstract of the Region of the ECWA, 1980; 1976  
.. - Not Available

In the context of Tables 1 and 2 it should be stressed that in the enumerated countries such sectors as food, beverages and textiles dominate, thus providing a basic information as to the existing sectoral composition of manufacturing industries of Islamic countries.

It should be mentioned that industrial production is picking up fast in countries like Malaysia, Iran, Algeria, Lebanon and Syria and that soon these countries will reach a considerable level of industrial production.

Following the analysis of the industrial base in the Islamic countries in general terms, it should be interesting to have a closer look into what kind of industries have been established, which development perspectives of these industries offer and in which countries industry may play a leading role in co-operative arrangements, etc. <sup>1/</sup>

<sup>1/</sup> The material for this analysis has been collected mostly from world-wide studies carried out by UNIDO in different sectors, without a closer look into the national statistics of individual Islamic countries.

One of the principal industries having an impact on the development of various industrial and manufacturing activities is the iron and steel industry. Among the Islamic countries only a few produced a significant amount of steel in 1975 or planned to start such production only a short time ago. These are Algeria, Egypt, Libya, Mauritania, Morocco, Iran, Pakistan, Iraq, Syria, Indonesia and Turkey. These countries were expected to produce together ca 28.5 million tons of steel by 1985 vis-a-vis total expected world production between 864-1015 million tons. <sup>2/</sup> In this context it should be interesting to look into the availability in the Islamic countries of natural resources such as coking coal, natural gas, hydraulic resources, stock of forest, iron ore, manganese ore, flared natural gas, etc., needed for the establishment of iron and steel industry and to find out which countries are in a favourable position to do so.

The UNIDO study on iron and steel <sup>3/</sup> specifies Algeria, Egypt, Gabon, Libya, Morocco, Tunisia, Iran, Iraq, Pakistan, Saudi Arabia and Turkey as possessing specially favourable conditions, for development of this industry specifically taking into account available natural resources.

It can be concluded that as far as co-operation in the iron and steel production is concerned, there is a broad though limited base at present for such effort, with a definite potential for technological co-operation in building up and expanding this industry in the future.

Closely related with the iron and steel industry - as major utilizers of raw materials - are the capital goods industry and the agricultural machinery and implements industry.

The capital goods industry which, in terms of its effect on the economy, resembles the automotive industry, is virtually non-existent in the Islamic countries. In some of them, i. e. Tunisia, Malaysia, Morocco, Algeria, Turkey, Egypt, Iran and Pakistan, it exists in its initial stages. <sup>4/</sup> The demand is being met predominantly through the

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- <sup>2/</sup>UNIDO/ICIS.61 - "Picture for 1985 of the World Iron and Steel Industry".
- <sup>3/</sup>UNIDO/ICIS.25 - "Draft Worldwide Study of the Iron and Steel Industry, 1975-2000".
- <sup>4/</sup>UNIDO/ICIS.70 - "Capital Goods Industry (Preliminary Study)".

importation of machinery from all over the world, mostly the United States of America, the Federal Republic of Germany, the United Kingdom, France, Italy, Japan and the USSR, as well as from some developing countries like India or Brazil.

Agriculture plays a very important role in the economies of the Islamic countries who are important suppliers of many foodstuffs and are also large importers of agricultural products, particularly the oil-producing countries. The production of agricultural machinery and implements usually has a direct influence on the level of agricultural development and the industry is therefore considered an important branch of manufacturing activities.

According to the UNIDO study on agricultural machinery, the following manufacturing facilities for agricultural machinery existed in selected Islamic countries in 1975:

Table 3:

<u>Country</u>	<u>Hand Tools</u>	<u>Farm Machinery</u>	<u>Engines</u>	<u>Tractors</u>
Chad	x	-	-	-
Jordan	x	-	-	-
Lebanon	x	x	-	-
Libya	x	x	-	-
Senegal	x	x	-	-
Somalia	x	-	-	-
PR Yemen	x	-	-	-
Cameroon	x	-	-	-
Saudi Arabia	x	x	-	-
Syria	x	x	-	-
Afghanistan	x	x	-	-
Algeria	x	x	x	x
Iraq	x	x	x	-
Morocco	x	-	-	-
Sudan	x	x	-	-
Egypt	x	x	x	-
Iran	x	x	x	x
Turkey	x	x	x	x
Indonesia	x	x	x	x
Pakistan	x	x	x	x

Source: UNIDO/ICIS.69, "Agricultural Machinery and Implements Industry" (Preliminary Study), and World-Wide Study on the Agriculture Machinery Industry - UNIDO/ICIS.119.

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An analysis of these data shows clearly that all Islamic countries which were examined have facilities and technology for producing simple hand tools, while only few may claim to possess a full range of products needed for efficient and modern agriculture and agricultural industry.

It is in this field where very interesting possibilities of technological and production co-operation may be identified and realized.

When considering the agricultural machinery industry and its relation to the agricultural sector, one cannot avoid mentioning the agro-industries, which play a very important role in the industrialization process particularly because of the availability of natural resources and the relatively low level of required investment.

In the case of the Islamic countries, the issue of agro-industries is even more important as a number of them belong to the so-called IDCs: Chad, Gambia, Guinea, Mali, Niger, Somalia, Sudan, Uganda, Afghanistan, Bangladesh, Dem. Rep. of Yemen, Maldives, PR of Yemen where the food supply situation is rather serious and furthermore the following belong to the group of countries most severely affected by food problems: Egypt, Guinea-Bissau, Mauritania, Senegal, Sierra Leone and Pakistan.

The pattern of world food processing industry is such that in 1975 one-hundred (100) leading TNCs in this field manufactured about 45% of the world food <sup>2/</sup> and according to some scenarios, this may increase to over 50% (!) by the year 2000.

As some agro-industries depend heavily on the proximity of the supply of raw materials, the Islamic countries should seriously consider undertaking decisive steps in this field not only to secure sufficient nutrition for their nation but also to develop a solid and independent technological base for further accelerated development of this primary industrial sector.

Finally, a few words should be devoted to the fertilizer and petrochemical industries as some of the Islamic countries are the world's biggest and only suppliers of basic raw materials for these industries.

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<sup>2/</sup>UNIDO/ICIS.65, "Draft World-Wide Study of Agro-Industries: 1975-2000".

The fertilizer and petrochemical industries are characterized inter alia by their heavy investment requirements and their technological complexity as they usually employ sophisticated processes and equipment. Basic raw materials for both industries are natural gas, naphta, fuel oil and coal, phosphate rock, sulphur and potash salt.

While the Islamic countries control substantially the raw materials for these industries (natural gas, crude oil, phosphate rock, sulphur), the industries themselves have been established outside the boundaries of these and other developing countries. <sup>6/</sup>

The above analysis of the industrial base of the Islamic countries would have major gaps if such industries as textile, simple industrial machinery, foundries and forging had not been mentioned, which are rather well established, particularly in countries like Egypt or Pakistan.

The present industrial base of Islamic countries offers justified hopes for closer and long-term co-operation as regards technological research and development in certain vital areas which will be identified in later parts of the present paper.

It is not the lack of physical or financial resources but of trained manpower which represents the greatest problem for the Islamic Countries - industrial and economic development and consequently its solution should be attempted systematically as the centre-piece of the over-all economic development strategy.

### III. R and D base in the Islamic Countries

The R and D base consists of institutions, equipment and manpower. Islamic countries have a considerable disadvantage in terms of technological base vis-a-vis industrialized countries, particularly as regards

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<sup>6/</sup>For example in 1980 world production of ethylene will amount to ca 58 million tons while Islamic countries to 1.8 million tons; vinyl chloride world production will be ca 18 million tons while Islamic countries over 0.6 million tons; in other products similar situation exists.

highly trained and professional manpower as well as - though to a lesser extent - in terms of available institutions and equipment. Table 4 provides such basic facts on the subject.

Another important issue to be mentioned in this connexion is the need for clearly defined long-term technological policy at the country level in accordance with long-term development goals.

It should also be clearly stated that technological policy which should not only include the identification of long-term objectives but also the mobilization of resources to attain these objectives, will play a decisive role in the co-operation attempt between Islamic countries as a whole or between groups of countries.

In terms of existing research and development base, the following basic data should be primarily considered:



Table 4: R+D EXPENDITURES IN SELECTED DEVELOPING COUNTRIES AND THE SHARE OF THESE EXPENDITURES BETWEEN FUNDAMENTAL, APPLIED AND EXPERIMENTAL DEVELOPMENT AS WELL AS ITS DIVISION BETWEEN PRODUCTION (INDUSTRY) AND HIGHER EDUCATION

COUNTRY	YEAR/CURRENCY	TOTAL IN 000	ON R+D AS % OF GNP	R + D		EXPERIMENTAL DEVELOPMENT- %	PRODUCTION	HIGHER EDUCATION
				FUNDAMENTAL %	APPLIED %			
Algeria	1972/Dinar	78,000	0.3	-na-	-na-	-na-	-na-	-na-
Chad	1973/Franc CFA	255,220	0.4	-na-	-na-	-na-	-na-	-na-
Egypt	1973/Pound	29,940	0.8	16.5	58.0	25.5	5,020	18,520
Gabon	1970/Franc CFA	1,895	0.9	-na-	-na-	-na-	-na-	-na-
Senegal	1972/Franc CFA	2,176,000	0.8	-na-	-na-	-na-	1,380,000	79,600
Sudar	1973/Pound	3,012	1.3	43.2	55.5	55.5	2,068	24
Cameroon	1970/Franc CFA	1,765,000	1.5	-na-	-na-	-na-	-na-	-na-
Bangladesh	1974/Taka	113,530	0.2	-na-	-na-	-na-	10,730	1,840
Iran	1972/Rial	3,531,807	0.4	-na-	-na-	-na-	2,742,818	581,537
Iraq	1974/Dinar	7,409	0.2	27.2	36.4	36.4	3,281	1,750
Jordan	1976/Dinar	2,039	0.9	-na-	-na-	-na-	-na-	-na-
Kuwait	1977/Dinar	6,284	0.3	8.0	20.8	11.2	1,801	617
Niger	1976/Franc CFA	141,703	-na-	-na-	-na-	-na-	-na-	-na-
Pakistan	1973/Rupee	150,040	0.2	-na-	-na-	-na-	134,840	7,940
Turkey	1977/Lira	6,466,409	0.3	-na-	-na-	-na-	-na-	467,305
Yemen	1974/Rial	9,923	-na-	-na-	32.2	67.8	5,906	-na-

Source: UNESCO Yearbook 1978/1979

As mentioned earlier, the research and development potential consists primarily of a combination of trained professional manpower and sufficient financial means for materials, equipment and institutions. A quick look at the share of research and development expenditure in GNP reveals a first common truth in that Islamic countries, like the prevailing majority of developing countries, spent very little on research and development in comparison to, for example, the United Kingdom where this share is 2.0%, Japan at 2.1% or Australia where it is at the level of 1.6%. Allocation of higher and higher resources, despite financial constraints, has to be initiated somehow and until enough resources become available to cover all or most of the important fields, narrow specialization and concentration of efforts in selected fields appears to be the practical guiding principle of research and development policy of the countries concerned.

Analysis of the division of total research and development expenditures between production and higher education is also revealing. Because of historic reasons countries which were studied allot higher amounts to education than to research and development in production in comparison with the United Kingdom and Japan or other industrialized countries.

Technological research and development may only be developed on the basis of demands and requirements of industry and here we observe another interesting phenomenon, where local industry in developing countries tends to obtain technological solutions from abroad, rather than from local research and development institutions. Whatever might have been its causes, psychological preference of the industrialists, incapacity of the institutions, etc.; the situation has to be remedied as soon as possible, as this will greatly contribute firstly to the enlargement

and strengthening of local technological capabilities, and secondly to the increase in demand on the part of industry on local - usually applied - research and development.

As regards manpower required for technological research and development, the situation of Islamic countries is not very favourable as illustrated in the following Table:

Table 5: Personnel engaged in Research and Development

<u>Country</u>	<u>Year</u>	<u>Scientists + Eng per 10,000 pop</u>	<u>Scientists + Eng per 10,000 pop engaged in R+D</u>
Algeria	1972	-	0.2
Chad	1971	-	0.2
Egypt	1973	166.6	3.0
Gabon	1970	-	0.2
Libya	1973	82.0	0.2
Senegal	1972	-	1.0
Sudan	1974	8.6	2.2
Tunisia	1972	6.0	1.5
Cameroon	1970	6.0	0.6
Bangladesh	1973	3.2	0.2
Indonesia	1975	n.a	0.8
Iran	1972	50.1	1.6
Iraq	1974	43.3	1.4
Jordan	1975	41.7	1.6
Kuwait	1973	24.2	2.5
Pakistan	1973	16.8	0.6
Qatar	1974	150.2	n.a
Saudi Arabia	1974	38.4	n.a
Syria	1970	43.7	n.a
Turkey	1972	n.a	2.3
Yemen	1974	2.2	0.1

Source: UNESCO Yearbook 1978/79.

As can be seen from Table 5 only Egypt and Qatar reached a proportion of scientists and engineers per 10,000 population similar to those in Western Europe, but while in Western Europe scientists and engineers engaged in research and development per 10,000 population oscillated between 13 and 38 (Australia 19.6; Japan 37.7 and United Kingdom 13.8), the best among Islamic countries may be found in Egypt (3.0), Kuwait (2.5), Turkey (2.3) and Sudan (2.2).

Therefore, not only financial means allocated for research and development were in both absolute and relative terms much lower among

Islamic countries, but also their manpower should greatly be expanded in years to come, as it presently falls short of the needs and requirements.

In terms of institutional infrastructure the analysis of available material shows that here also a great disparity exists between Islamic countries.

Strong research and development centres in the technological sense exist for example in Turkey, Pakistan, Algeria and Egypt which may and should therefore take lead in certain fields as well as provide support and assistance to similar institutions in other Islamic countries.

In other countries, apart from those mentioned above, there are no research and development facilities in the true sense, or else they are of a very low level; some are just being established and need time to start more significant and concrete research and development work.

The largest group of Islamic countries have some technological research and development facilities but either with insufficient personnel or with insufficient financial means at their disposal. The Federal Institute for International Scientific Education, Cultural and Technical Co-operation in Belgrade published in 1975 a list of research and development institutions established in developing countries. In the field of general technological research and development, including standardization and quality control, only five Islamic countries were listed with a total of 16 different institutions, in chemical engineering seven countries were mentioned with 10 institutions and in mining only 5 countries and 5 institutions. Such countries for example as Saudi Arabia, Iraq or Iran were not mentioned in those statistics, although mining operations are rather important to them contributing very significant share to their respective GNP.

A great deal of effort is therefore required on the part of Governments of Islamic countries to expand their existing research and development base, and create a favourable environment for research and development work. Islamic countries are also not free from the brain-drain, particularly countries like Pakistan and Egypt, and here co-operation among Islamic countries may be particularly welcomed and needed.

The next part of the present paper will deal with the prospects of

technological co-operation among Islamic countries on a global and regional basis and attempt to formulate certain co-operative schemes for closer consideration by the Conference.

IV. Some considerations as to perspectives and possibilities of co-operation in the field of development and transfer of technology among Islamic countries

As mentioned earlier, the concrete possibilities of co-operation among Islamic countries in the field of technological development should be based primarily on common objectives and goals as well as on common interests. Difficulties of closer co-operation among Islamic countries on a global scale ranging from geographical location of individual countries to the difference in development objectives, combined with the variety of natural and other available resources have been enumerated in this and other papers for the Conference.

It is therefore imperative that technological co-operation should be based on several mutually re-enforcing approaches and global, regional and particularly sub-regional and sectoral objectives are thus much closer, taking also into account the existing political and economic groupings like, for example, the ASEAN or the Arab League.

Bearing in mind the above considerations the Conference is requested to consider how to prepare and then gradually implement an agreed long-term programme of co-operation in which financial and manpower resources are pooled together to solve the most critical technological problems of the countries concerned; one practical suggestion worthy of consideration is the creation of an Umbrella institution which acquires in due course the capacity to oversee the total situation, provide a nucleus for policy measures to co-ordinate and strengthen existing R and D work, initiate new work and generally assist in implementation of decisions on items (a) to (f) below. The feasibility of such an institution may be generally examined by a group of leading and renowned scientists researchers and technologists of Islamic countries. It will constitute a good starting point for this Conference to decide the dates and the venue of such a meeting and if possible decide upon its terms of reference and list of invitees:

- (a) Joint programme for extension of manpower required for technological research and development;
- (B) Identification of leading research and development centres for the purpose of establishing subregional technological centres of excellence in selected industrial sectors;
- (c) Establishment of joint general guidelines for the development of technological policies at the country level;
- (d) Creation of an Islamic Technological Fund to finance certain research and development activities;
- (e) Collective position vis-a-vis foreign suppliers when importing crucial technology of interest to a certain group of countries;
- (f) Increased bilateral or multilateral technological co-operation among interested individual countries and their research and development institutions.

The above list is not exhaustive nor does it cover all possible areas of technological co-operation. Nevertheless, it attempts to draw the attention of Governments concerned to existing options and possibilities where joint (co-operative) effort may likely bring certain concrete results. The list may be extended and amended by new ideas in the course of implementation of the programme. Without pre-judging the outcome of the proposed meeting the following thoughts are being presented to stimulate detailed examination of the issues and/or by the meeting of the Scientists.

- (a) Joint programme for extension of manpower required for technological research and development

The programme should lead to gradual increase of the quality and quantity of manpower available for technological research and development in Islamic countries. It should be oriented primarily towards the provision of facilities enabling further education and scientific work of potential and new specialists. These facilities could be, inter alia, a system of scholarships and training programmes, etc. The programme should also lead to the gradual return to their home countries of specialists and professionals presently employed abroad.

In this connexion, it is worth mentioning the UNDP/UNITDO experimental programme in Turkey entitled "Retransfer of Technology", under which quite a number of Turkish nationals, living currently abroad, returned to their home country to work and assist local industry and research and development institutions in solving specific industrial and technological issues.

- (b) Identification of leading research and development centres for the purpose of establishing subregional technological centres of excellence in selected industrial sectors

Technological research and development require concentrated and long-term efforts in order to yield results, and dispersal of existing means over a large number of research and development centres would not prove to be very productive.

In certain areas like iron and steel in Turkey, textiles in Egypt and Pakistan, rubber in Malaysia, mining in Jordan and Morocco there exist research and development facilities with potential for further growth and they might therefore be turned into efficient subregional technological centres where main research and development in those fields could be carried out. Selection of such lead centres should be done rather carefully taking into account related fields having real long-term development potential.

On the basis of the existence of industries in some Islamic countries and the availability of relatively well advanced industrial research and development institutions, it is suggested that sub-regional centres might be established for the following sectors: iron and steel, food technology, textiles and agro-machinery.

New research and development centres for the development of strategic resources may also be considered, and might possibly be the subject of co-operation schemes with existing institutions outside Islamic countries in such areas as oil and gas exploration and technology, mineral development research, etc. In the latter case, however, larger financial means will be required over very long periods.

Such ventures like Gulf Organization for Industrial Consultancy

may serve as well as centre of excellence in industrial consultancy, constituting basic pre-conditions for further R and D development.

- (c) Establishment of joint general guidelines for the development of technological policies at the country level

At the subregional level, it may be possible to co-ordinate, to a certain extent national policies on technological development and general guidelines might be jointly established for this purpose.

An attempt of this nature may be found in the recommendations of the Conference on Industrial Property and Transfer of Technology for Arab states, organized jointly by the Government of Iraq, UNIDO and WIPO held in Baghdad in March 1977, where certain aspects of co-ordination and development of national technological policies were discussed and agreed upon. <sup>1/</sup>

Among the specific issues worth mentioning in this respect are the establishment of an integrated central national body dealing with all matters pertaining to industrial property and transfer of technology, review and promulgation of existing and new legislations in the area of licensing, trademarks, patents and industrial design, establishment of central institutions for Arab countries for matters pertaining to industrial property, and finally to introduce similar legislations regulating the flow of technologies aiming at the elimination of restrictive contractual provisions.

- (d) Creation of an Islamic Technological Fund to finance certain research and development activities

It is suggested that an Islamic Technological Fund may be established with the following main objectives:

- (i) to finance research and development activities and individual projects of interest to groups of countries and to their industrial development, as well as to group of companies in participating countries;

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<sup>1/</sup>See: IDCAS/UNIDO/WIPO/IRAQ-13 "The Report"



- (ii) to provide financing of equipment, etc. for existing and new research and development facilities on terms to be agreed upon;
- (iii) to finance manpower development of existing and new research and development facilities in Islamic countries;
- (iv) to finance research and development work which may be immediately applied either to the industries or the agriculture of participating countries;
- (v) to finance joint large research and development programmes of interest to a group of interested countries requiring larger financial means (particularly in the field of strategic natural resource development);
- (vi) to act as a focal point for technological activities of the Islamic countries.

Certain activities of the proposed Fund may be carried out under the programmes mentioned in (a) and (b) above.

- (e) Collective position vis-a-vis foreign suppliers when importing crucial technology of interest to a certain group of countries

This area of co-operation may include, inter alia, a joint approach to purchasing certain crucial technologies, particularly in such sectors as petro-chemicals, fertilizers, iron and steel or food technologies, in order to avoid the repeated purchase of the same technologies or at least to substantially reduce the cost.

Another area worth considering the continuous exchange of information on contractual conditions of technology transactions between countries concerned.

In March 1978, UNIDO initiated such programme called Technological Information Exchange System (TIES) and the following Islamic countries have agreed to participate: Algeria, Egypt, Iraq and Malaysia. The TIES is intended as a mechanism through which participating countries can exchange, according to an established pattern, detailed information on all contracts related to the transfer of technology. UNIDO is presently carrying out such a programme for 21 countries on a mutual and voluntary basis which enables the participants to have better access

to information on technology transactions. Information is exchanged at six-month intervals starting from 30 June 1978 and at present contains information on ca 6,000 agreements in force in these countries. <sup>3/</sup>

This system which is open to any developing country willing to furnish such information, might be expanded in order to include all Islamic countries.

- (f) Increased bilateral or multilateral technological co-operation among interested individual countries and their research and development institutions

It is suggested that countries whose patterns of development bear certain similarities might increase their bilateral technological co-operation both at the research and development as well as at the industry levels.

Exchange of information of a technological nature, visits, joint research programmes could be considered as a starting point and should be in accordance with objectives of national technological policies of individual Islamic countries.

Another interesting option which may be of interest to the Conference, and which could ultimately only be resolved at the national level but which lends itself as subject of technological research, is the satisfaction of the basic needs of most Islamic countries, i. e. the provision of shelter, food and clothing, employing so-called appropriate industrial technologies. <sup>2/</sup>

In this connexion particularly development and expansion of building materials as well as construction industries is to be taken up preferably through suggested Islamic Technological Fund, as those belong to the basic bottlenecks among the majority of Islamic countries.

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<sup>3/</sup>See, ID/WG.325/11 - Final Report of the Fifth Meeting of Heads of Technology Transfer Registries.

<sup>2/</sup>See, Materials from the International Forum on Appropriate Industrial Technology held in India, November 1979.

It is suggested furthermore that in addition to pure technological research and development co-operation schemes could be established in the area of para-technological activities like engineering and design, consultancy, etc., to meet the needs of modern industries at present heavily dependent on foreign sources, to develop local capabilities and skills and, as a result, to lower the present high cost of acquiring technologies from the highly industrialized countries.

Expanded technological co-operation among Islamic countries particularly with least developed on the basis of TCDC programmes should aim, in the long term, at lowering their dependence on foreign supply of technology, increasing the standard of living and economic development, and at a shorter perspective at creating more employment, developing local technological capabilities and decreasing the present high cost of the supply of imported technology.

## CONCLUSIONS

Existing industrial base as well as technological research and development potential of Islamic countries represent a rather fertile ground for the initiation and implementation of technological co-operation among Islamic countries.

Availability of strategic and rich natural resources, skilled manpower and industrial and technological infrastructure, represent sufficient potential for accelerated growth, provided that existing possibilities are streamlined and concentrated on selected areas and sectors.

An interaction and linking of technological research and development with industry are vital pre-conditions for concrete results in both areas as neither could develop in isolation.

It would seem that industry is in a particularly good position to address its problems indigenous research and development in order to provide impetus for increased technological co-operation.

Certain concrete areas of co-operation have been identified which, given due consideration, may ultimately lead to increased co-operation and accelerated growth of the economy of the countries concerned.

The fulfilment of ambitious plans will, however, require strong political will, time and increasing resources over a long period of time.

Last but not least specific effort should be directed towards accelerated industrial and economic development of the least developed among Islamic countries, as these countries may and will mostly benefit from the increased co-operation schemes outlined or suggested in the present paper.



