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Item 6(a) of the provisional agenda

**PROGRESS MADE IN THE IMPLEMENTATION OF THE WORK PROGRAMME**

**MICROELECTRONICS AND INFORMATICS IN THE ESCWA REGION**

Note by the Secretariat

Activities in these fields are carried out under ESCWA programme element 3-1, "Identification of regional projects in capital goods and other engineering industries", and 3-3 "Specialized industrial technologies" of the 1984-1985 work programme. They have the following objectives:

- To assess the degree of penetration of microelectronics and informatics technologies and applications in the Arab countries, and to examine the potentialities of these technologies in the development of the region;
- To formulate a plan of action to enhance the promotion of these advanced technologies in the region;
- To implement activities related to more pressing needs in the region, in particular those activities necessitating regional co-operation and co-ordination.

Activities related to these programme elements include:

- Strengthening ties with national and regional institutions concerned with these technologies in the region as a step towards the establishment of an Arab Regional Network on Informatics and Microelectronics;
- Identification and promotion of those industrial projects, software and hardware, which lend themselves to regional co-operation;
- Implementation of joint activities with national institutions concerned.

Within this programme element ESCWA undertook with UNIDO (United Nations Industrial Development Organization) and the French "Direction de l'Industrie Electronique et de l'Informatique" (DIELI) fact-finding missions to selected Arab States in 1983 and held an expert group meeting in Kuwait in March 1984. The findings of the missions and the recommendations of the 1984 meeting led ESCWA to consider a comprehensive approach to the programme as detailed below.

A comprehensive approach to the development of microelectronics  
and informatics technologies in the region

Considering the findings and recommendations of the missions and meeting described above, the joint ESCWA/UNIDO Industry Division conceived of a two-phase comprehensive programme of concerted co-operative activities with national and regional institutions. The first phase in 1985-1987 would lead to the development of a Regional Plan of Action (RPA), to be implemented with governments of member States in the second phase for the period, 1987-1991. Support for this programme is being pursued with the United Nations Development Programme (UNDP) and other sources of financing.

It is estimated that such an approach would achieve the following:

(a) Thorough understanding of the problems and needs facing the development of local capabilities in microelectronics and informatics, particularly in areas of training and Arabization;

(b) Closer co-operation and co-ordination with national and regional institutions;

(c) Regional concept of activities through regional planning and decentralized implementation of activities;

(d) Direct involvement and participation of member governments;

(e) Clear arrangement of priorities and division of tasks, since RPA will address itself to the following:

- Governments;

- National and regional institutions;

- International organizations, particularly United Nations organs;

(f) Comprehensive vision to be elaborated in RPA, it would stress the training aspect and the needs for further research on Arabization. It is to include estimates of manpower and financial resources required for the implementation of RPA and for each of the planned activities.

The first phase includes the immediate provision of "Technical Assistance and Advisory Services" on aspects related to the proliferation of computerization projects in the region, since many requests for such assistance were expressed by local institutions. It includes as well selected training and Arabization activities, and measures for the elaboration of the necessary RPA.

The first phase, 1985-1987, includes activities already implemented (or expected to be implemented by end of March 1986) and ongoing activities leading to the development of RPA and the establishment of an Arab Regional Network on Informatics. Based on activities undertaken during the first phase, ESCWA in co-operation with members of the Provisional Regional Network and in consultation with member States, would develop an RPA, to be implemented in the second phase, 1987-1991.

Activities implemented by 31 March 1986

A. Finding of missions\*

ESCWA/UNIDO fact-finding missions on microelectronics and informatics were carried out during the second half of 1983 in preparation for the expert group meeting and subsequent activities. Further specialized missions were undertaken in 1984 and 1985 as described below. The relevant findings of the missions were the following:

(a) Most countries of the region were engaged in accelerated programmes of computerization. Similar problems were facing most projects such as: shortages of manpower, inadequate planning, inefficiency of "Arabization techniques", under utilization of hardware, lack of proper software, etc.

(b) Software development activities in the region were limited to most common applications. Specialized software applications, such as networking, data-base management, information technology, etc., were being introduced slowly owing to lack of qualified local expertise.

(c) Computer-Aided Techniques, and other sophisticated informatics applications, such as CAD, CAM, CAE, CAI (Computer-Aided Design, Computer-Aided Manufacture, Computer-Aided Engineering, Computer-Aided Instruction) and Robotics, were very slowly introduced owing to lack of qualified manpower, slow dissemination of up-to-date information, difficulty of access to sources of technology, etc.

(d) Microelectronic manufacturing industries were being introduced at a very slow pace (as in Iraq, Algeria and Morocco). The common problems facing these industries were: the limited size of the market, the lack of R&D (Research and development) activities, the fast development of the technology, the difficulty of access to sources of technology, etc.

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\* See the following:

- ESCWA "Mission to Paris, 12-23 September 1983" on microelectronics (no symbol).
- "Mission report on micro-electronics in the ECWA region" (8-24 October 1983) (no symbol).
- Mission report on "micro-electronics in the ECWA region" II, 20 November - 2 December 1983, Baghdad-Riyadh-Dhahran-Abu Dhabi (E/ECWA/ID/84/4 (part II) of 15 February 1984).
- Mission report on "micro-electronics in the ECWA region" III, 5-16 December 1983, Tunis, Casablanca and Rabat (E/ECWA/ID/84/4 (Part III) of 15 February 1984).

B. ESCWA/UNIDO Expert Group Meeting on Microelectronics and Informatics\*

The meeting was held from 4 to 7 March 1984 in Kuwait, hosted by the Kuwait Institute for Scientific Research (KISR). The Governments of the Netherlands and France participated in the financing of the meeting. Over 100 experts participated, mostly from the region, with participants from advanced countries and from more industrialized developing countries. The objectives of the meeting were:

(a) To review major issues related to microelectronics and informatics technology and applications, in the context of the Arab countries;

(b) To consider ways and means to develop capabilities in these technologies;

(c) To establish links with national and regional institutions concerned with the promotion of these technologies in the region.

High priority was given in the meeting to the development of an RPA and to the establishment of an Arab Network on Informatics and Microelectronics. The relevant conclusions and recommendations were the following:

(a) A workshop on "Computer Processing of the Arabic Language" should be organized and a plan of action relating to efforts exerted in this field should be prepared.

(b) Available electronic components industries should be assessed and the potentialities and feasibility of a "Regional Silicon Foundry and Design Centres" should be studied.

(c) A Provisional Regional Network on informatics should be established as a step towards the establishment of a formal network.

(d) A five-year regional plan of action to co-ordinate regional activity and promote the build-up of capability and infrastructure in these fast-moving technologies should be formulated.

(e) Joint activities related to more pressing needs in the region in the field of microelectronics and informatics should be organized and implemented.

C. Workshop on Computer Processing of the Arabic Language\*\*

As an implementation of one of the Kuwait meeting recommendations, and in preparation of further activities in the field of "Arabization of

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\* See meeting Final Report (E/ECWA/ID/WG.8/42), June 1984.

\*\* See final report of workshop, Computer Processing of the Arab Language, April 14-16, 1985, Kuwait, Workshop Papers, Vols. I and II (no symbol).

informatics", the above-mentioned workshop was held in Kuwait from 14 to 16 April 1985, in co-operation with KISR, and the Arab Fund for Economic and Social Development. The objective of the workshop was to review and assess major issues and problems relating to the computer processing of the Arabic language and to formulate a plan of action whereby all efforts in this field might converge in a foreseeable and attainable result. Over 120 experts, working on various aspects of Arabization, participated in the workshop, including many experts from outside the region.

The main recommendations were the following:

(a) A task force should be organized, composed of experts in various related fields - linguistics, mathematics and computer sciences - to define the requirements of an expandable computerized Arabic dictionary - i.e., lexical data base. Based on the outcome of the interdisciplinary group work, it is proposed to formulate and implement pilot application projects in computational linguistics, such as the development of "Teaching Aids" for Arabic grammar;

(b) All forms of exchange of information and experience among experts working in the fields relating to computer processing of the Arabic language should be enhanced, in particular the following:

(i) Publication of periodic newsletter;

(ii) Organization of informative and co-ordination meetings, workshops and seminars;

(iii) Development of a regional network as a forum to institutionalize regional co-ordination and co-operation.

In preparation of the workshop and to identify experts and institutions working in the field of Arabization, ESCWA undertook missions to selected Arab countries<sup>1/</sup> in late 1984 and early 1985. The missions were very effective in securing the participation of experts working in the field of Arabizations in the countries visited. The proceedings of the workshop were reproduced and distributed to participants. Moreover, the co-sponsoring institutions decided to publish selected proceedings of the workshop in English and Arabic, concentrating on papers related to Arabic computational linguistics. Selected proceedings are expected to be published by the end of 1986.

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<sup>1/</sup> See the following reports:

- Mission to the Gulf States 27 October - 13 November 1984 Mission Report on Micro-electronics and Petrochemicals of 26 November 1984 (no symbol).
- ECWA/UNIDO/DIELI Joint Mission to Egypt, Tunisia, Algeria and Syria on Silicon Foundry Project 22 March to 3 April 1985 of 16 July 1985 (no symbol).

D. A study on "Silicon Foundry and Design Centres" in the Arab Region

Through the findings of earlier missions and the deliberations of the Kuwait 1984 meeting, it was determined that, though there were no viable electronic industries, the Arab region represented a promising market for many electronic products (components and systems). Furthermore, considering on the one hand the low demand for integrated circuits (IC) in the region and the high requirements in capital and human resources for the establishment of a viable IC manufacturing industry in every country in the region, and considering on the other hand, the necessity for the Arab countries to gain insights and experience in the important microelectronic design and manufacturing technologies, it was determined that IC design and manufacturing offered an excellent industrial development project that would lead to regional co-operation and joint investment. A reasonable proposed course of action would be to enhance design capability through well-developed design centres in various countries of the region, linked to one or two regional silicon foundries and manufacturing facilities.

In this respect and as an implementation of one of the Kuwait meeting recommendations, ESCWA and UNIDO, in co-operation with the French DIELI undertook specialized missions to selected Arab States<sup>1/</sup> with the following objectives:

(a) To study the potentialities and feasibility of establishing a regional silicon foundry and design centre in the Arab region;

(b) To consult with institutions concerned about their interest in such foundry and design centres.

The missions were received with great interest by various institutions concerned and close links were established with the two manufacturing facilities in the region, the Al-Mansour Unit in Baghdad and the Sidi Bel Abbas facility in Algeria, whereby a plan for joint action was under consideration to upgrade available manufacturing facilities and to build up the technical capabilities acquired by those facilities over the past years. In Algeria the Commissariat aux Energies Nouvelles (CEN), supervising the R&D activities at Sidi Bel Abbas, and the Entreprise National des Industries Electronique (ENIE), supervising the operation of the facilities, offered to host a technical workshop open to various Arab experts, to deliberate on the findings and recommendations of ESCWA and UNIDO. The workshop was scheduled for 27-29 January 1986.

<sup>1/</sup> See the following reports:

- Notes for the file, Mission of Mr. Gilbert to ESCWA, 30 November - 6 December 1984 on "Silicon Foundry" Study of 14 January 1985 (no symbol).

- Notes for the file, Mission of Messrs. Matheron and Micolet to ESCWA, 3-6 December 1984 or Silicon Foundry Project of 9 January 1985 (no symbol).

- ESCWA/UNIDO/DIELI joint Mission to Egypt, Tunisia, Algeria and Syria op. cit.

ESCWA and UNIDO, after the findings of the joint missions and the recommendations of participating experts, prepared a pre-feasibility study to set up a regional silicon foundry and related design centres in various countries of the region. The pre-feasibility study was reproduced under the title "Silicon Foundry and Design Centres in the Arab Region: Issues and Approaches"<sup>1/</sup>. It assessed available facilities and capabilities for the design and manufacturing of IC and other electronic products in the region, and proposed approaches to enhance the microelectronics industries and to build up capabilities in technology in the region.

E. Workshop on "Silicon Foundry and Design Centres" (27-29 January 1986)

To deliberate on the joint paper prepared and to formulate a concrete plan of action ESCWA and UNIDO accepted the invitation of CEN and ENIE of Algeria to host a technical Workshop on the subject. The objectives of the workshop were:

(a) To review the pre-feasibility study on the establishment of a regional silicon foundry with design centres within the overall context of the development of electronics industries in the region and problems faced, including the building up of technological capabilities in this respect;

(b) To formulate a concrete plan of action in regard to the question of establishment of a silicon foundry and other matters related to the strengthening of technological capabilities in microelectronics in the region.

The workshop was attended by about 60 participants from various institutions in the region concerned with microelectronics technology, design and industry: industrial companies, R&D centres, universities, development and investment institutions, etc. Seven Arab countries were represented (Algeria, Egypt, Iraq, Lybia, Saudi Arabia, Syria and Tunisia). Among the participants were representatives of the Arab Fund for Economic and Social Development, The Arab Industrial Development Organization, AIDO, along with experts and consultants of ESCWA, UNIDO and DIELI.

The main recommendations of the workshop were:

(1) A training programme for design of application specific integrated circuit to be implemented in a Multi-Project-Chip;

(2) A prefeasibility study of a Pilot Line for production of integrated circuits;

(3) A co-ordination meeting for Arab Electronics industries to be held before the end of 1986;

(4) A request for ESCWA, UNIDO, and AFESD and AIDO to co-operate in the implementation of the above recommendations.

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<sup>1/</sup> See document E/ESCWA/ID/86/CRP/I of 12 January 1986.



The workshop called on Arab governments to establish a special fund for research, development and training in microelectronics technology and applications.

F. Second Baghdad International Conference on "Computer Technology and Applications" (24-26 March 1986)

At the request of the Iraqi National Computer Centre ESCWA accepted the invitation to participate in organizing the said Conference, sponsored by the Centre in co-operation with the Iraqi Electronic and Computer Research Centre, the Intergovernmental Bureau of Informatics (IBI), and UNESCO. The objectives of the Conference were to present the state of the art of computer technology and application, to analyse problems impeding effective utilization of the technology in the Arab countries and to develop specific applications to serve national needs. The Conference had two main streams: (1) State of the art and international trends; and (2) Informatics for development; with specialized sessions about more specific, highly technical topics.

Invitations to participate in the Conference were extended to persons from Arab countries working in the field of informatics, particularly researcher, university lecturers, professionals and graduate students in computer-related fields. About 300 persons participated from Iraq, with 45 from other Arab countries as well as about 30 international participants. About 75 papers were presented and will be published in the Conference proceedings.

Ongoing activities

A. Provisional Regional Network on Informatics

Informatics and microelectronics are among advanced technologies that have a very changing nature: exchange of up-to-date information and co-operation across national boundaries are of crucial importance for the development of local capabilities in these fields, even in advanced countries.

Based on findings and recommendations mentioned above, ESCWA, in co-operation with UNESCO and UNIDO and in consultation with concerned institutions in the region, moved to build up an Arab Regional Network on informatics, with a parallel branch on microelectronics, to undertake the following tasks:

(1) Co-ordination of regional activities, enhancing joint activities, bilateral or multilateral co-operation, etc.;

(2) Co-operation in circulating news related to regional activities in the fields of informatics and microelectronics;

(3) Elaboration and implementation of programmes for diffusion of the technology in the region at the national and regional levels (including training programmes for development of human resources in the field);

(4) Participation in the formulation of a Regional Plan of Action for the Arab countries (that would include and elaborate training aspects in informatics and applications thereof) for 1987-1991.

The Networks would aim at enhancing links among member institutions through bulletins, meetings, consultation mechanisms and possible development of regional data bases on relevant aspects of the technology. It would create and enhance channels for flow and exchange of knowledge, technology and technical and advisory services. It would also support joint bilateral and multilateral activities and provide technical and financial support of the United Nations development system.

UNESCO, having in its work programme a similar element calling for the establishment of an Arab Regional Network on Informatics, invited member States to a technical meeting held in Amman from 6 to 9 May 1985. The meeting was attended by representatives of seven Arab States: Egypt, Iraq, Jordan, Kuwait, Saudi Arabia, Tunisia and the United Arab Emirates. ESCWA participated actively in the meeting.

The participants approved in principle the formation of the Regional Network and called on UNESCO and ESCWA to co-operate in undertaking needed steps to establish the network. Moreover, and after a recommendation from ESCWA, the meeting recommended the formation of a provisional network as a step towards the establishment of the formal network.

Pending final commitment by member governments of the region and benefiting from the strong encouragement and commitment in principle of various national institutions concerned with the idea of the network, and as a crucial step towards regional co-operation, and to enhance the exchange of information and experience in the region, ESCWA initiated activities to develop a functional provisional regional network that would undertake some of the tasks of a formal RN and would prepare the ground for a later commitment and approval of the governments of the region. The Provisional Regional Network (PRN) would link various institutions concerned in the region, with ESCWA as the focal point and executing agency, and with tacit support of the United Nations development system.

In this respect ESCWA forwarded letters to member States and to institutions concerned in the region, inviting them to participate in activities of the planned Provisional Regional Network (PRN). Agreements in principle were received from four member States (United Arab Emirates, Iraq, Jordan and Egypt), five regional institutions: the Arab Standards and Metrology Organization (ASMO), the Arab Industrial Investment Corporation (AIIC), the Arab Telecommunication Union (ATU), the Federation of Arab Scientific Research Councils (FASRC), the Gulf, Co-operation Council (GCC) and the Arab League Educational, Cultural and Scientific Organization (ALECSO) and five institutions from countries where no designated focal points on informatics were assigned (e.g., RSS (Royal Scientific Society) in Jordan and CERS (Centre d'Etudes de Recherches Scientifiques in Syria).

UNESCO called for a co-ordination meeting in March 1986 to prepare the agenda of the meeting for the PRN planned for end 1986. The PRN activities for 1986-1987 included the following:

(a) Two co-ordination/planning meetings; one of the meetings would concentrate on the deliberation of the assessment of training needs and Plan of Action for 1987-1991;

(b) Exchange of visits and services among members of PRN, in particular ESCWA, would encourage exchange of training programmes and consultancies among member of PRN;

(c) Participation in the formulation and implementation of activities listed in this programme.

B. Arabization project

The Workshop on Computer Processing of the Arabic Language called on ESCWA, in co-operation with the Arab Fund and other national and regional institutions concerned with computer Arabization, to follow up on the implementation of the main recommendations of the Workshop, namely:

(a) The formation of interdisciplinary groups of experts to define the requirements of an expandable computerized Arabic dictionary;

(b) The development of the expandable dictionary;

(c) The formulation and implementation of a pilot application such as "Teaching Aids" for Arabic grammar, based on the results of the above efforts.

It was determined that ESCWA could be a provisional focal point to implement the project in co-operation with the Arab Fund for Economic and Social Development. The project would include subcontracting major research efforts to national institutions undertaking such basic and applied research. A project proposed to this effect was submitted to UNDP, the Arab Fund and the United Nations ECDC/TCDC (economic co-operation among developing countries/technical co-operation among developing countries) programme for funding.

C. Assessment of training needs in informatics

ESCWA has been receiving from member States various requests for training programmes in Computer Sciences and Informatics, since many countries in the region have been implementing computerization projects at a rapid pace which has led to acute shortages of qualified manpower, in spite of the establishment of many national training institutions. The need for training in the region has been assessed as vast and changing; an elaborate programme has to be formulated that would take into consideration the needs, priorities and available human and financial resources.

Consequently, a study to assess regional training needs in informatics and computer science is to be undertaken in detail, listing needs in various aspects of the technology and application, ordering priorities and formulating a plan of action. The study would include missions to selected Arab States to collect needed information and consult with national institutions concerned. The study would also consider the necessity and feasibility of establishing a regional training centre in informatics. A project proposal to this effect was elaborated as part of the UNDP project proposal.

D. Assessment of R&D needs in informatics

Many institutions in the region have been undertaking research related to development of applications specific to the region, with a few cases reaching the implementation stage, they were facing similar problems: shortages of qualified human capabilities, difficulties in procuring equipment and components, delays in receiving references and catalogues, and, most of all, absence of linkage with local industries and business circles and lack of mechanisms for "internal transfer of technology". A study is to be undertaken to assess R&D efforts in the region, related to micro-electronics and informatics other than Arabization, to analyse problems facing these efforts and immediate needs, and to develop a work plan aiming at enhancing these efforts and at alleviating some of the problems they face. This activity is part of the comprehensive informatics project submitted to UNDP for financing.

E. CAD/CAM training programme

The Governments of Iraq and Egypt have offered to host and co-finance regional training activities related to CAD/CAM techniques as applied to engineering industries. ESCWA, UNIDO and the concerned institutions in Iraq and Egypt co-operated to formulate the details of the programmes. Each subregional programme consisted of a three-day informative seminar directed to senior engineers and technical managers, to be followed by a 10-day training seminar catering to practicing engineers and designers with experience in mechanical design.

In preparation for this programme ESCWA, in co-operation with UNIDO, undertook missions to selected Arab States<sup>1/</sup> including Iraq, Egypt and Saudi Arabia with the following objectives:

(a) To assess the need for, and the potential advantage of promoting CAD/CAM techniques in the region;

(b) To establish links with the institutions concerned and to deliberate with these institutions about the modality of a suitable CAD/CAM programme in the region.

F. Publication of a Regional Monitor Newsletter (RMN)

In line with the recommendations of the above-mentioned meetings, it is

<sup>1/</sup> See the following reports:

- Notes for the file, Visit to Mr. A. Dewachi, Information Processing Centre, Ministry of Industry, Baghdad, Iraq of 14 January 1985 (no symbol).

- Notes for the file, Mission of Mr. Zieturski to ECWA, 30 November - 10 December 1984 on CAD/CAM Programme (no date and no symbol).

- Mission to the Gulf States, op. cit.

- CAD/CAM Technology in Countries of the ECWA Region, UNIDO report of 13 January 1985 (no symbol).

planned to issue a newsletter on a biannual basis, starting from the first year of operation, and gradually to proceed to a quarterly basis. Topics will include the following:

- Up-to-date information on the technology, mostly adopted from the UNIDO publication, Microelectronics Monitor;
- Circulation of RPN news and activities, particularly relating to Arabization;
- News of trends and activities in the region and analysis of these activities;
- Deliberation on the activities in the first phase of the programme and the RPA.

G. Elaboration of the Regional Plan of Action (RPA)

Based on the outputs and experience gained from the above activities and assessments of needs in the region, and in consultation with the provisional network, a detailed RPA for 1987-1991 shall be formulated to include the following:

- (a) Recommendations for policies and action by member governments;
- (b) Detailed plan for regional activities and training programmes to be implemented by national institutions and members of the Regional Network (RN), in co-operation with regional and international organizations;
- (c) A detailed work programme for United Nations development systems with ESCWA as executing agency and focal point of the RN. The work programme shall include estimates of manpower and financial resources required for the implementation of the RPA and for each of the planned activities.

The RPA would concentrate on formulating aspects related to training and development of human resources.