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UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

THE UNIDO PROGRAMME OF TECHNOLOGICAL ADVANCES:
MICROELECTRONICS**

Note prepared by the
UNIDO Technology Programme

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INDUSTRIAL DEVELOPMENT ABSTRACTS

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ABSTRACT: <UNIDO pub> on the <role of UNIDO> in the field of
                      <microelectronics> - covers (1) actions by UNIDO at the
                      international level (2) <regional level> and <national
                      level> activities (3) relevant publications issued by UNIDO
                      (4) operational <technical assistance> projects implemented
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1.   Following the Third General Conference of UNIDO in 1980, a major new programme of activities was initiated by the Technology Programme of UNIDO dealing with the potentials and implications of technological advances for developing countries. Those advances are not only creating new industries but have substantial implications for a number of other industries. The convergence of these technological advances itself produces an interaction, which in turn has implications for the pattern and rate of industrial production in developing countries. In other words, in planning their industrial development and for achieving the Lima target,[1]/ developing countries have to recognize that the present and coming decades are likely to witness substantial changes in production patterns owing to the expected interplay of the new advanced technologies. These technologies have potential as well as limitations for developing countries and it should be part of the industrial and technological strategy of each developing country to see how it can tap the potential of the new technologies without being affected by their limitations.

2.   The Fourth General Conference of UNIDO which took place in Vienna from 2-19 August 1984 included an agenda item on the subject of strengthening the scientific and technological capabilities for industrial development in developing countries. In the debate on this item attention was drawn by the Secretariat to the changing technological world scene and the consequent need for the developing countries to rectify past deficiencies and to come to grips with the new situation. As technological advances were expected to affect a wide range of industrial sectors, it was necessary for each country to reduce to a minimum the adverse consequences of those advances and to maximize their benefits through a selective and differentiated policy adapted to its own requirements. UNIDO's programme in microelectronics was commended and support was expressed for promoting the establishement of regional and international centres for selected technologies including the networking of existing institutions in the respective regions. Develcping countries may identify gaps in existing arrangements with a view to considering setting up national, regional and interregional facilities and networking existing centres including research and development institutions.

1/   The Second General Conference of UNIDO, held at Lima, Peru, in March 1975, set a target of a 25 per cent share of world industrial production for the developing countries by the year 2000.

3. · The Conference also recognized that the new technologies will have a wide-ranging impact on industrial development and endorsed the importance of strengthening scientific and technological capabilities for industrial development in developing countries; it urged UNIDO to assist developing countries in building their technological capabilities in different fields of technology including the setting up of national groups to monitor and assess technological trends and the changing international market and promote core groups or institutions in selected technological advances.

4. The concept of promoting specific projects for international co-operation aimed at the betterment of the life of the poorest of the poor, which had originally been formulated at the International Forum on Technological Advances at Tbilisi (USSR) in April 1983, was also presented to the Conference. Its objectives were generally supported and there was agreement that appropriate technologies including advanced ones should be promoted and developed to meet particular needs of a clear urgency to mankind. Microelectronics is a suitable candidate technology as it can be beneficially employed in health care for the rural poor; educational and information purposes in decentralized locations etc.

5. The UNIDO programme on technological advances was designed, in particular, to increase awareness through early identification and assessment and to promote action at national, regional and international levels regarding:

   (a) The potential and limitations of various advanced technologies for the developing countries;

   (b) The industrial and technological capabilities that the developing countries need in order to be able to use advanced technologies where appropriate and feasible;

   (c) The policy actions to be taken by the Governments of developing countries with regard to advanced technologies.

6. In addition to expert group meetings, studies and current awareness bulletins, emphasis has been laid on:

    (a) Mobilizing the co-operation of individuals and institutions at the cutting edge of a particular technology;

    (b) Promoting national action by developing countries in terms of policies and programmes in accordance with their conditions and requirements;

    (c) Providing technical assistance, as required by developing countries;

    (d) Identifying and promoting developing-country-specific applications as also application in various industrial sectors.

7. Activities have been developed within the framework of the foregoing considerations, bearing in mind the nature of the technological advances and the type of practical action that would be most effective in each case.

8. The position in regard to microelectronics is described below briefly, indicating the activities carried out at international, regional and national levels.

Actions by UNIDO at the International Level

9. In June 1981 a meeting of experts was organized on the implications of technological advances in microelectronics for developing countries. The meeting emphasized the importance of actions at the national level relating to manufacture, industrial and other applications, software development and the formulation of a national microelectronics strategy. Actions at the international level were also recommended, including a continuous monitoring of observed trends and their impact on various sectors and the development of pilot projects and programmes dealing with applications and software.

10.   Following the June 1981 meeting, a mission of experts visited four developing countries in different regions to promote selective applications of microelectronics and software development. Apart from reviewing the national situation in the countries visited, the mission recommended an approach to microelectronics application, including software and suggested models of microprocessor application centres and software houses. Also as a result of the June 1981 meeting, certain activities at the regional level were pursued. These are described in a later section.

11.   The International Forum on Technological Advances and Development organized by UNIDO in Tbilisi, USSR, in 1983 as well as expert meetings in Moscow, USSR (December 1982), and Dubrovnik, Yugoslavia (June 1983), which respectively preceded and succeeded it, examined the subject of technological advances and development with regard to specific technologies of which microelectronics was an important one. A suggestion was also made in the Forum that an international centre for microprocessor applications should be established; as a starting point for examining the various requests for regional and international action, a series of country case studies have been initiated, aimed at the national level, but also to identify the scope for regional and international co-operation. It is expected these studies will provide concrete information and meaningful approaches for regional and international action. Country studies published so far cover Bangladesh, Brazil, India, the Republic of Korea, Pakistan and Venezuela. An overview of the microelectronics industry in these countries has also been prepared.

12.   In an effort to co-ordinate the activities of organizations and professional groups active in the area of information technology for development, the UNIDO Secretariat convened a meeting in Vienna from 21 to 23 March 1984 which brought together representatives of these groups, identified possible areas of co-operation and considered a mechanism for keeping mutually informed and for formulating joint programmes. In addition to representatives of organizations, selected specialists from developing countries were also invited to present their countries' policies and requirements. As a result of this meeting a Consultative Group on Information Technology (COGIT) has been established which will meet periodically to review ongoing activities, exchange experience and formulate joint programmes. A directory of these groups and organizations will also be prepared by UNIDO which will be updated as new organizations join COGIT.

13.   The UNIDO Secretariat has tried to promote the concept of software as an industry and the actions that developing countries could take to promote that industry. The concept has been elaborated through three studies dealing with the importance of software for developing countries; the approach to software development in those countries; and guidelines for software production. Further work in this area would include the promotion and development of software for specific applications of relevance to developing countries including applications in various industrial sectors. A report on the commercialization of software: main issues and contractual terms and conditions, was prepared and submitted to the Ninth Meeting of Heads of Technology Transfer Registries. Through these efforts and by other means it is proposed to build up a bank of application software for the benefit of developing countries.

14.   Information technology, as covered by the term "informatics" and extending beyond data-bank systems and networks to industrial management tools and industrial processes, is in a stage of dynamic growth, particularly through the use of microprocessors. UNIDO co-sponsored a Conference on Informatics and Industrial Development with the Irish National Board for Science and Technology and Trinity College, Dublin, in March 1981. The Conference highlighted the importance developing countries attach to information developments, which are of substantial consequence to current industrial development strategies. UNIDO has also brought out a publication on informatics and industrial development.$\underline{2}/$

15.   In response to the articulated needs of Member States, UNIDO commenced preparatory work for the establishment of an International Project for Transfer of Microelectronics and Software Technology. The concept was worked out by UNIDO staff and has been preliminarily examined by specialists from private enterprises and universities as well as by government officials.

Regional Level Activities

16.   An Expert Group Meeting for the Economic Commission for Latin America and the Caribbean (ECLAC) region was held by UNIDO in June 1982 in Mexico, in co-operation with ECLAC, at which the socio-economic implications of

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$\underline{2}/$ "Informatics for Industrial Development", Development and Transfer of Technology Series No. 22 (or document No. UNIDO/IS.415).

microelectronics advances for Latin American countries were analysed and a
Co-operative Latin American Programme of Action in the field of
microelectronics recommended.

17.   As a step in this direction a Latin American Microelectronics Network
including the Caribbean (REMLAC) was proposed following a high-level expert
team mission to Venezuela in 1983. At the request of the Government, the
experts looked at the facilities of an existing national institution in
Venezuela with a view to upgrading it with UNIDO's assistance to become a
nodal point for the proposed network. At a meeting which took place in June
1985 in Caracas, Venezuela, REMLAC was established and a programme of
co-operation among the participating countries was initiated (see also
paragraphs 23-25).

18.   A symposium on Microelectronics for Productivity held at New Delhi in
April 1983 and co-sponsored by UNIDO requested UNIDO to take the lead in the
promotion of the establishement of an Asian Centre for Electronics. National
level studies in selected Asian countries have been undertaken to ascertain
the needs for regional co-operation.

19.   UNIDO has also co-operated with the Economic and Social Commission for
Western Asia (ESCWA) in the preparation for and conduct of the Expert Group
Meeting on the Development of Microelectronics in the ECWA region,
4-7 March 1984, Kuwait. Recommendations made at that meeting requested UNIDO,
inter alia, to look into the possibility of establishing a silicon foundry
with design facilities in the ECWA region. A UNIDO consultant undertook a
preliminary mission in December 1984 which has been followed up by an in-depth
study[3]/ of microelectronics facilities and cababilities in the countries of
the region to assess the scope and potential in the region for design and
fabrication of customized integrated circuits (ICs).

20.   An ESCWA/UNIDO workshop on a regional silicon foundry and design centres
was jointly organized with the Government of Algeria and held at Sidi Bel
Abbas on 27-29 January 1986. The workshop agreed on the main conclusion
contained in document UNIDO/IS.583 that the establishment of a regional
silicon foundry cum design centres with a network of national centres should
be pursued in an evolutionary manner. Recommendations were made for

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3/   Document UNIDO/IS.583: "Silicon Foundry and Design Centres in the Arab
      Region: Issues and Approaches".

establishing design groups and the implementation of a multi-chip project; market studies for application-specific integrated circuits; a feasibility study for one or two pilot-plant-level silicon foundries in the region; and upgrading the two existing bipolar facilities to serve the purpose of regional co-operation. The Arab Fund for Economic and Social Development and the Arab Industrial Development Organization expressed concrete interest in financing certain follow-up activities such as the feasibility study for the pilot silicon foundry; market studies as well as a project for an Arab multi-chip. UNIDO will also support the national workshop organized by ESCWA on Computer applications, on 26-29 March 1986 in Baghdad, Iraq.

21. In regard to Africa, UNIDO co-sponsored with UNCSTD, OAU and ECA a meeting of African scientists on the implications of new technologies in the implementation of the Lagos Plan of Action and the programme for the Industrial Development Decade for Africa. The meeting was held in Mbabane, Swaziland, from 22 to 26 October 1984.

22. A national meeting on applications of microelectronics and software was organized by UNIDO in Kenya and took place from 18 to 23 February 1985. Representatives from countries of the region such as Ethiopia, Sudan, Tanzania, Uganda and Zambia attended.

23. The Regional Meeting for the Initiation of a Regional Network for Microelectronics in the ECLAC Region (REMLAC), organized by UNIDO in co-operation with the Sistema Economico Latinoamericano (SELA) and the Economic Commission for Latin America and the Caribbean (ECLAC) was held at Caracas on 3-7 June 1985. Representatives from eight countries in the region, viz, Argentina, Brazil, Cuba, Guatemala, Jamaica, Mexico, Peru as well as the host country Venezuela participated. Representatives from the Junta del Acuerdo de Cartagena (JUNAC), the Latin American Technological Information Network (RITLA), the Caribbean Industrial Research Institute (CARIRI), the International Development Research Centre (IDRC) and the Intergovernmental Bureau of Informatics (IBI) attended as observers.

24. The meeting unanimously agreed on the structure as well as work programme of REMLAC and the network was established on a pilot basis as from 7 June 1985 for a period of six years. The detailed conclusions and recommendations adopted by the meeting are as follows:

25.   The country representatives agreed that the institutions indicated by
their governments in sub-paragraph (e) below shall perform functions as the
Regional Network for Microelectronics for Latin America and the Caribbean
(REMLAC) on the following basis:

(a)   The network is established on a pilot, inter-institutional basis
        from 7 June 1985 for a period of six years or until it acquires an
        intergovernmental personality, whichever is earlier.

(b)   The overall objective of the network is to carry out joint
        activities with the aim of strengthening technological capabilities
        in microelectronics in the participating countries individually and
        collectively, in order to apply the technology for meeting their
        specific needs;

(c)   Participation in the network is open to all countries in the Latin
        American and Caribbean region. The following countries represented
        in the meeting will be the initial members, i.e. Argentina, Brazil,
        Cuba, Guatemala, Jamaica, Mexico, Peru and Venezuela. The meeting
        called upon other countries in the region to join the network;

(d)   The network will comprise of, and operate through, national nodes,
        (i.e. national centres or groups) in the member countries. There
        will be only one node per country acting as the focal point and
        other local entities should link up to the network through the
        national node. National nodes may have different functional
        characteristics, but typically would include R+D and applications
        capabilities;

(e)   Representatives from some of the participating countries have
        indicated their national nodes as follows:

Argentina: National Electronics Programme, Subsecretariat of Informatics
                and Development
Brazil: Instituto de Microelectronics do Centro Technologico para
                Informatica
Cuba: Centro Científico Técnico

Guatemala:	Secretaria General de Planificacion Economica (SEGEPLAN) (in the first instance)
Jamaica:	National Computer Centre
Mexico:	Instituto de Investigaciones Eléctricas (in the first instance)
Peru:	Instituto Nacional de Investigación Technológica Industrial y Normas Técnicas (ITINTEC)
Venezuela:	Fundación Instituto de Ingeniería

26.   Following the meeting establishing REMLAC, a UNDP-funded regional project for strengthening microelectronics infrastructure and capabilities in REMLAC member countries will start in 1986. The main objectives of the project are: strengthening capabilities in countries at earlier stages of microelectronics development; examining national and regional application possibilities in selected industrial sectors; strengthening capabilities in the acquisition of hardware and software; monitoring technology and market trends in microelectronics for policy formulation and decision making; strengthening design capabilities, including multi-chip design and fabrication, and establishment of silicon foundries; and establishing and strengthening semiconductor manufacturing capabilities in the region.

27.   Initially, UNIDO fielded an expert who visited the nodal points in all member countries of REMLAC, i.e. Argentina, Brazil, Cuba, Guatemala, Mexico, Peru and Venezuela, to identify national activities aimed at strengthening negotiating capabilities in the acquisition of hardware and software. Another suggested element of the REMLAC programme relates to the multi-project chip. UNIDO has approached high-level scientists and technologists in order to obtain their views on the multi-project chip activity for REMLAC. The general view was that the multi-project chip activity would be a very interesting exercise for Latin America and could be the basis for strengthening technological capabilities in Latin America in the field of design of custom and semi-custom chips. In order to gather preliminary information about possible Latin-American co-operation in this activity a questionnaire has been prepared by UNIDO and sent to all focal points for reply.

National Level Activities

28.   At the national level, apart from the state-of-the-art studies commissioned, the UNIDO Secretariat has been assisting the Mexican Government in setting up a permanent national team to monitor technological advances through a project financed by the UNFSSTD. Under this project a national level workshop was held. Thereafter three experts specifically looked at the microelectronics industry in its several aspects and suggested, in the light of the technology trends in the world, the actions that the Mexican Government could pursue.

29.   A number of technical assistance projects are being implemented by UNIDO in this field and an illustrative list of these projects is in Annex I.

30.   Other activities in this field include: support to a training workshop in Brazil; studies on biomedial applications and power devices prepared on the basis of that workshop; a pilot project for a rural development information system in the state of Karnataka, India, and a field study on computerization of small-scale sector industry in India. A national workshop on selected aspects of information technology was held in Argentina in March 1986, cosponsored by UNIDO and IDRC. UNIDO also assisted in the organization of a ..ational Workshop on Microelectronics, Port-of-Spain, Trinidad and Tobago, 10-12 February 1987. The workshop identified priority areas of microelectronics and software applications in the country and issued recommendations for future development.

Relevant Publications Issued by UNIDO

31.   The impact of microelectronics has been looked at in UNIDO's programme of industrial studies from the point of view of restructuring world industry. Two studies have been completed: "The impact of microelectronics on the international economic setting: the case of computer-aided design",4/ "Restructuring world industry in a period of crisis - the role of innovation: an analysis of recent developments in the semi-conductor industry".5/

4/   UNIDO/IS.297
5/   UNIDO/IS.285

32.   A quarterly bulletin, the Microelectronics Monitor, has been published
by the Technology Programme since January 1982 to create awareness and provide
current information to a target audience of policy-makers, scientists and
technologists, particularly in developing countries. A survey of technological
and market trends during 1982 - 1983 has been published by the Monitor.[6/] A
special supplement reviewing developments in flexible manufacturing systems
(FMS) was published in February 1985.[7/] A review of the state-of-the-art of
Gallium-Arsenide research is contained in issue No. 15 of the Monitor.

33.   A comprehensive list of documents published so far by the Technology
Programme of UNIDO with regard to microelectronics is attached as Annex II.

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6/   UNIDO/IS.438

7/   UNIDO/IS.539

ANNEX I

List of Relevant Operational Technical Assistance

Projects Implemented by UNIDO

COUNTRY	PROJECT NUMBER	PROJECT TITLE
Albania	DP/ALB/84/001	Electronic instrumentation, automation and process control development
Bulgaria	DP/BUL/81/002	Strengthening of the Institute for Industrial Cybernetics and Robotics
Bulgaria	DP/BUL/81/008	'Numerical Control/Computer Aided Manufacturing (NC/CAM) Metalworking Development Centre' (phase II) (related to UC/BUL/84/196)
Bulgaria	DP/BUL/82/001	Automated Production Instrumentation Centre (A.P.I.C.)
Bulgaria	UC/BUL/84/117	Assistance to the introduction of microelectronics in industry
China	DP/CPR/80/050	Training and development of micro-computer systems application
Democratic People's Republic of Korea	DP/DRK/79/003	Establishment of a pilot plant and training centre for bipolar digital integrated circuits
Democratic People's Republic of Korea	DP/DRK/84/001	Development of numerically controlled machine-tools
India	DP/IND/81/025	Development of microprocessor based agro-dairy instruments
India	DP/IND/82/033	Computer aided design programme
India	DP/IND/82/034	Appropriate automation promotion programme
India	DP/IND/84/015	Semiconductor devices and electronic sub-systems for transportation

India	DP/IND/84/030	Microprocessor application engineering programme
Iraq	SI/IRQ/85/804	Introduction of a computerized maintenance system in textile industry
Republic of Korea	DP/ROK/82/026	Mechanical engineering computer application (MECA) programme (application of CAD/CAM techniques in mechanical industries)
Republic of Korea	DP/ROK/82/031	Numerical control centre
Turkey	RP/TUR/85/002	Assistance in establishing a computer aided design/computer aided manufacturing (CAD/CAM) training programme at Gazi University
Venezuela	UC/VEN/86/190	Assistance in upgrading Fundacion Instituto de Ingenieria (Venezuela, Caracas)
Regional	DP/RLA/86/003	Preparatory assistance for a regional project for strengthening microelectronics infrastructure and capabilities in REMLAC member countries
Interregional	UC/INT/84/261	Technical co-operation between the Institute for Industrial Cybernetics and Robotics (Bulgaria) and the Instrument Design, Development and Facilities Centre (India)

ANNEX II

List of Documents Published by the UNIDO Technology Programme on the
Implications for Developing Countries of Advances in Microelectronics

Expert Group Meeting on Implications of Technological
Advances in Microelectronics for Developing Countries,
Vienna, 10-12 June 1981

UNIDO/IS.246 and Corr.1	Implications of Micro-Electronics for Developing Countries: A Preliminary Overview of Issues
UNIDO/IS.242/ Rev.1 and Corr.1	Report cn Exchange of Views with Experts on the Implications of Technological Advances in Micro-Electronics for Developing Countries

UNIDO/ECLA Expert Group Meeting on Implications
of Microelectronics for Developing Countries,
Mexico, 7-11 June 1982

ID/WG.372/1	Prospects of Microelectronics Application in Process and Product Development in Developing Countries by Michael Radnor
ID/WG.372/2	Microelectronics and Government Policies: The Case of a Developed Country by Ernest Braun, Kurt Hofman and Ian Miles
ID/WG.372/3	Microprocessors and Productivity: Cashing in our Chips by Robert T. Lund
ID/WG.372/4	Microelectronics and Telecommunications in Latin America by Edgardo Galli
ID/WG.372/5 and Corr.1	Microelectronics: Its Impact and Policy Implications by Juan F. Rada
ID/WG.372/6	Potential Applications Suitable for Microprocessor Implementations: Some Illustrative Possibilities by James Oliphant
ID/WG.372/10	Elements for the Formulation of a Regional Programme of Action in the Area of Microelectronics by Carlos Aguirre and Roberto Heredia
ID/WG.372/11	Telecommunications and Microelectronics: Some Observations by E. Galli, M. Welch and R. Herrera
ID/WG.372/12	The Development of Microelectronics in Argentina by O. Filipello and R. Sagarzazu
ID/WG.372/13	Cultural Aspects of Microelectronics Technology by Carlos I.Z. Hammans

ID/WG.372/14   Microprocessor Applications and Industrial Development by
                Robert T. Lund

ID/WG.372/15   Microelectronics and the Development of Latin America:
                Problems and Possibilities for Action by ECLA/UNIDO Joint
                Industry and Technology Division and Eugenio Lahera and Hugo
                Nochteff

ID/WG.372/16 · Microelectronics in Peru. Country Monograph by R. Herrera

ID/WG.372/17   Report, UNIDO/ECLA Expert Group Meeting on Implications of
                Microelectronics for the ECLA Region, Mexico City, Mexico,
                7-11 June 1982

**Discussion Meeting on Information Technology for
Development, Vienna, Austria, 21-23 March 1984**

ID/WG.419/1   Microelectronics Applications for Developing Countries:
                Preliminary Issues for Concertetd Action

ID/WG.419/5   Commonwealth Secretariat - Commonwealth Science Council: Aims
                and Activities by Peter Hutchinson

ID/WG.419/6   Activities of the British Computer Society's Specialist Group
                for Developing Countries by J. Sherif

ID/WG.419/7   Some Activities Related to Microelectronics in Developing
                Countries by Ward Morehouse

ID/WG.419/8   Microcomputer Processes at Vita: An Overview by Cary L.
                Garriott

ID/WG.419/9   Information Technology in Argentina. National Policies and
                Needs by Edgardo Cohen, Andres Dmitruk and Alberto Godel

ID/WG.419/10   Centre Mondial Informatique et Ressource Humaine:
                International Actions by J. Todd Simonds

ID/WG.419/11   Information Technologies for Development: Ongoing Research at
                the Research Policy Institute by Bo Goeransson

ID/WG.419/12   Some Thoughts on Sharing Information for Information
                Management by Judy Brace

ID/WG.419/13   Report, Meeting on Information Technology for Development,
                Vienna, 1984

**National Meeting on Applications of Microelectronics
and Software, Nairobi, Kenya, 18-23 February 1985**

ID/WG.437/1   Development of Electronics in Tanzania by Octavian S. Mageni

ID/WG.437/2   Development of Electronics in Ethiopia by Getachev Degefu

ID/WG.437/3   Microelectronics and Informatics Policy for Development in
              Kenya

ID/WG.437/4   The Prospects for Software Production in Developing Countries
              by Hermann Kopetz

ID/WG.437/5   Microcomputers and the District Focus for Rural Development in
              Kenya by Garry L. Garriott

Regional Meeting for the Initiation of a Regional
Network for Microelectronics in the ECLAC Region
(REMLAC), Caracas, Venezuela, ?-7 June 1985

ID/WG.440/1   The Use of Public Purchasing as a Tool to Develop
              Technological Competence in Microelectronics by E. Lalor

ID/WG.440/2   Telecommunications and Information Technology in Latin
              America: Prospects and Possibilities for Managing the
              Technology Gap by Mike Hobday

ID/WG.440/3   Proposed Structure of the Regional Network for
              Microelectronics in the ECLAC Region

ID/WG.440/4   Some Considerations on the Content and Modalities of a
              Programme of Work for REMLAC

ID/WG.440/5   Research and Development in Microelectronics in Argentina,
              Brazil, Mexico and Venezuela by G. F. de la Garza

ID/WG.440/6   Report on the UNIDO Mission Preparatory to the Establishment
   and Add.1   of a Regional System for Microelectronics in Latin America
              (REMLAC) by G.F. de la Garza and M. Octavio

ID/WG.440/7   Government Policies for the Data Processing Industries in
   and Corr.2 Argentina, Brazil and Mexico by Hugo Nochteff

ID/WG.440/11 Approach to Regional Microelectronics Co-operation Programme
              by S. Wajnberg

ID/WG.440/12 Report, Regional Meeting for the Initiation of a Regional
              Network for Microelectronics in the ECLAC Region (REMLAC)

UNIDO/IS.230 Technological Perspectives in Machine Tool Industry with
              Special Reference to Microelectronics Applications by
              S.M. Patil

ID/WG.384/5/ Microelectronics and Developing Countries: Towards an
   Rev.1   Action-oriented Approach

ID/WG.401/6   Some Considerations about a Practical Approach to the
              Development of Technical Infrastructure for Microelectronics
              by G. F. de la Garza

Division Documents

UNIDO/IS.331	Prospects of Microelectronics. Application in Process and Product Development in Africa by Michael Radnor
UNIDO/IS.338	Proceedings of the First Meeting on Co-operation between Scientific and Industrial Sectors in Microelectronics held at Mexico City, 14-15 June 1982
UNIDO/IS.351	Microprocessor Applications for Developing Countries by James Oliphant
UNIDO/IS.383	Problems of Software Development in Developing Countries
UNIDO/IS.392	The Impact of Microelectronics on Biomedical Applications in Developing Countries by C.L. Claeys
UNIDO/IS.415	Informatics for Industrial Development by Richard J. Nolan
UNIDO/IS.438	Technology and Market Trends in the Production and Application of Information Technology by John Bessant
UNIDO/IS.439	Guidelines for Software Development in Developing Countries by R. Narasimhan
UNIDO/IS.440	Guidelines for Software Production in Developing Countries by H. Kopetz
UNIDO/IS.444	A Silicon Foundry to Service Developing Countries' Needs: A Preliminary Approach by the UNIDO Secretariat
UNIDO/IS.445/ Rev.2	The UNIDO Programme of technological Advances: Microelectronics by the UNIDO Secretariat
UNIDO/IS.446	Software Engineering: A Survey by W. Turski
UNIDO/IS.489	State-of-the-Art Series on Microelectronics No. 1 Venezuela No. 2 India No. 3 Republic of Korea No. 4 Pakistan No. 5 Bangladesh
UNIDO/IS.500	Overview of the Microelectronics Industry in Selected Developing Countries by S.E. Lalor
UNIDO/IS.511	The Brazilian Telecommunication Industry: Accumulation of Microelectronic Technology in the Manufacturing and Service Sectors by Mike Hobday
UNIDO/IS.522	Mid-Decade Review of the Implementation of the Vienna Programme of Action by Y. Nayudamma
UNIDO/IS.526	Survey of Government Policies in Informatics

UNIDO/IS.529   The UNIDO Programme on Microelectronics: An Analytical
Perspective by R. Narasimhan

UNIDO IS.531   Technology Monitoring in the Information Technology Sector in
Argentina by S.E. Lalor

UNIDO/IS.539   Flexible Manufacturing Systems - An Overview by John Bessant

UNIDO/IS.542   Optical Fibre Production by E. Bonek, B. Furch and H. Otruba

UNIDO/IS.546   The Brazilian Microelectronics Industry and its Relationship
with the Communications Industry by S. Wajnberg

UNIDO/IS.550   Guidelines on Application of Micro-Computers in Mineral
Processing Laboratory: Technical Data for Determining the Fair
Price of Ores in Developing Countries by P. Gado

UNIDO/IS.553   Role of National Planning in Science and Technology Means for
Changing the Technological Dominance of Industrialized
Countries/Comments on experiences in selected countries by
Jon Sigurdson

UNIDO/IS.554   Guidelines for the Formulation of a Basic Policy and
Development Plan for Science and Technology by Hyung Sup Choi

UNIDO/IS.574   Trends in Commercialization of Software in Developing
Countries by Carlos Correa

UNIDO/IS.583   Silicon Foundry and Design Centres in the Arab Region: Issues
and Approaches

UNIDO/IS.597   Guidelines for the Establishment or Redesign of Industrial and
Technological Information Services System, Including Selection
of Software and Hardware by J. Bankovski and A. Wysocki

UNIDO/IS.605   Guidelines for the Formulation of National Industrial and
Technological Information Policies - Based on Indian
Experience by N. Seshagiri

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