OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

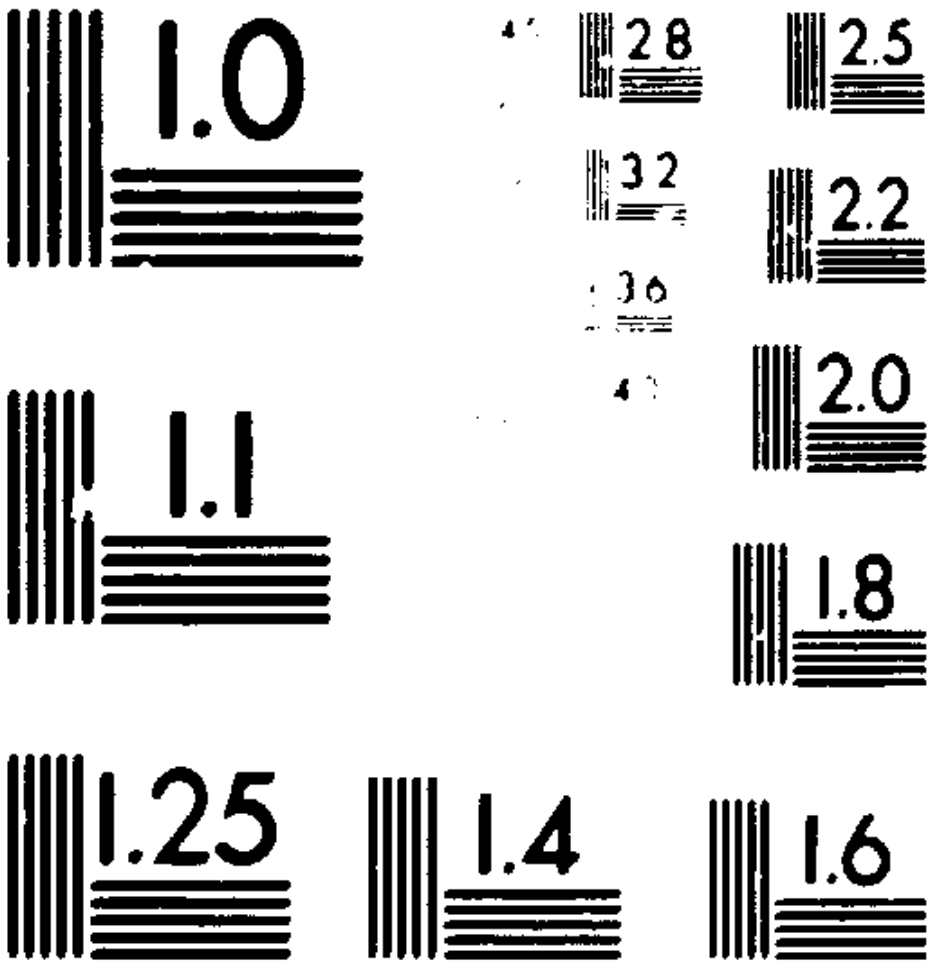
FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org



AFRICAN EXPERT GROUP MEETING

TO ASSESS THE IMPLICATIONS OF NEW TECHNOLOGIES

FOR THE LAGOS PLAN OF ACTION

14177

AN UNPACKAGED APPROACH TO THE MICROELECTRONICS TECHNOLOGY

BY

BADRAN MOHAMED BADRAN

ENGINEERING INDUSTRIES ORGANIZATION

CAIRO, EGYPT

1984

1984

- History of microelectronics

The history of what has been called microelectronics technology can be dated back to 1971 when the first microprocessor was introduced by Intel. It was an integrated Circuit containing the processor unit for a 4- bit computer. In 1973 Intel introduced on 8-bit microprocessor, an IC matching the image of a computer. This was followed by Motorola and Zilog's popular Z80, making possible the boom for micro processors and microcomputers.

- The microcomputer industry

Micro processor chips themselves are based on semi conductor technologies, i.e. IC and LSI technologies. But unlike ICs and LSIs, they feature a general purpose usefullness very similar to computers. In addition microprocessors themselves are not finished, ultimate products. They manifest their functions by being incorporated as components of other machines and apparatus. For this reason, their applications cover a very wide area and their potential market can be considered as nearly limitless.

Microprocessors have both the features of mass production-oriented industrial manufactured products and of knowledge- industry-oriented products. When viewed from the hardware (chip) angle, they are mass produced commodities; when viewed from the standpoint of applied technologies, they are high knowledge-value - aided commodities.

Unlike custom LSIs, microcomputers feature inside computer processors of the stored program type, and by adding software, they are made to realize the functions required. Consequently, they feature general purpose workability.

The software programs are prepared by manufacturers of microcomputer-applied machines and apparatus. In most cases, software production is conducted according to programs developed by the microcomputer users themselves. However microcomputer applications have also given birth to a very extensive and successful business called system houses or software houses which work as the suppliers of the productive capacity of the know-how for these software programs.

Both manufacturers who make products using these devices as well as system houses that are in persuit of sophisticated applications for these items all can play their respective roles in the industrial and social structure of a country.

- The microelectronics technology package

Microelectronics technology can be disintegrated into subsets of technologies each of which can be studied in terms of its applicability to a certain country at a certain time, depending on the resources, human and material, which are available or can be obtained at that stage of development of that country. These subsets can be specified as follows:

- Awareness and knowledge of the potential of microprocessor based equipment and system in improving the efficiency, reliability and or performance of work in specific applications
- knowledge of how to operate, install and service microprocessor based equipment and systems
- The ability to specify and design a system or a gear of microprocessor based equipment to perform a certain function
- The design and development of the soft-ware for various applications of a system
- The design at microprocessor based equipment and assembling them through importation of standard chips, components and sub-assemblies from international markets
- Production of chips starting at some stage of the manufacturing process according to imported designs, licencing and know-how
- Design and development of chips and processes

- Involvement of underdeveloped countries in the microelectronics technology

- Underdeveloped countries have to gain control over at least the first two subsets in the previously listed subsets of microelectronics technology. Since underdeveloped countries are importing most of their needs of capital goods, professional equipment as well as many of the consumer products, most of which incorporate to a certain extent microprocessors, the knowledge and awareness of their potentials, how to operate, install and service them becomes inevitable. The resources and skills required in these areas are not beyond the capabilities of underdeveloped countries
- The next two subsets in the list can be considered as a high value-added or labour intensive type of activity. The development of these subsets can be considered a direct link to the progress of the technological capabilities and the entire economic structure of a country toward a higher level of sophistication and a higher value added structure. Here again many of the underdeveloped countries have the resources and the infrastructure for production of designs and software

- The need for software is growing enormously and the market for software products is rather open. Underdeveloped countries can have a substantial advantage in producing software for export to developed countries with small portions of the cost compared to the cost of production in developed countries

- In the information - oriented society of the future, the development of the microelectronics industry should be considered from a stand point which perceives microelectronics not simply as a manufacturing industry producing electronic machines (i.e. hardware), but as an information indsutry which covers a wider area and exercises a tremendously great influence on other industries, services and the whole economic and social structure of a country - Microelectronics technology is the very technology concerning the processing, storing and transmitting of information

- The semi-conductor manufacturing industry is an industry where large scale research and development investments must always be made. By comparison with other industries, its technological renovation is more active and the life cycle of its products is shorter. A huge investment is required for development which involves risk and a long pay-back time. Governments should play an important role in research and development in the semi conductor manufacturing area when such industry becomes feasible in a country. The decision, however, of investing in this industry should not be made before careful examination of its feasibility is made. Laboratory scale or pilot plants can be the proper approach to semiconductor manufacture in under developed country

- <u>The Egyptian situation</u>

  A. Concerned institutions have been aware of the implications of this technology. The following is a quotation from a document published by the Academy of Scientific Research and Technology of Egypt titled "Towards a technology policy for Egypt".

  "Dealing with new technolcgies is considered one of most important fields for developing national capacities. A number of developing countries perceived the high importance of direct dealing with sophisticated sciences and advanced technologies. It is not any more possible to just observe and follow-up the big events occuring in developed countries and to be thrilled by them. Nowadays, these sciences and technologies became very influencial regarding the future of nations and their cultures; even more, they are influencial regarding the continuation or the extinction of these cultures.

Consequently, it is important to create in Egypt positive reactions and attitudes to dealings in sophisticated sciences and advanced technologies. This can be done by establishing a chain of centers of excellence in some chosen fields, such as: new and renewable energy - micro electronics - genetic engineering and bio-technology -high polymers (plasticisers - plastics). These centers are considered, from the functional point of view, as the arm of the state extended towards the future. Through them, Egypt deals to-day with tomorrow events."

B. Bilateral government cooperation

Under the terms of an agreement between the Government of the Federal Republic of Germany and the Government of Egypt on cooperation in the field of scientific research and technological development, an agreement was signed in June 1983 to carry out a joint "study on the development of the electro-technical and electronics industry of Egypt".

The study is to present a comprehensive analysis of the Egyptian electrical and electronics industry, related markets, and the entired periphery. It is to serve as a basis from which appropriate strategies for the future development and proposals for implementation can subsequently be developed.

The study is conducted by German experts together with their Egyptian counterparts on a cooperative basis. By this way a certain know-how flow is guaranteed already during the execution of the study and the results will be borne by both sides. The Egyptian Government then will receive a neutral strategy paper outline a sound course of development for the electrical and electronics industry up to the year 2000.

The study will be executed in two phases, the first phase covering preparation of knowledge (common basis) and elaboration of detailed reports will cover the following

- recommended new industries or products
- case study of existing industries
- extension and development of existing industries
- market study for the above mentioned industries. This phase will last for 18-24 months.

The second phase will cover the following.

- elaboration of strategies on the development of the electrotechnical and electronics industry
- prefeasibility studies of the recommended industries or products. This phase will last 8-12 months.

The product groups to be covered by the study are

- Power engeneering products
- Electronic products other than consumer products
  - Telecommunication equipment
  - Compnents for electrical equipment
  - Semi conductors
  - Medical electronics
  - Security systems
  - Data systems and office machines
  - Computers
  - Wires and cables
  - Industrial electronics
- Consumer electrical and electronic products
- New and renewable energy equipment

C. UNIDO was called upon to asses the capabilities of Egypt introducing microelectronics technology. Two reports were submitted to the Egyptian Governmer One by Dr. H.J. Schneider titled "Recommendations for introducing software competence in developing countries", Egypt being one of the countries subject of the study. The other one by Dr. K. Fialkowski, project titled "selective(microelectronic applications in developing countries". Countries subject of the study were Egypt, India, Thailand and Mexico.