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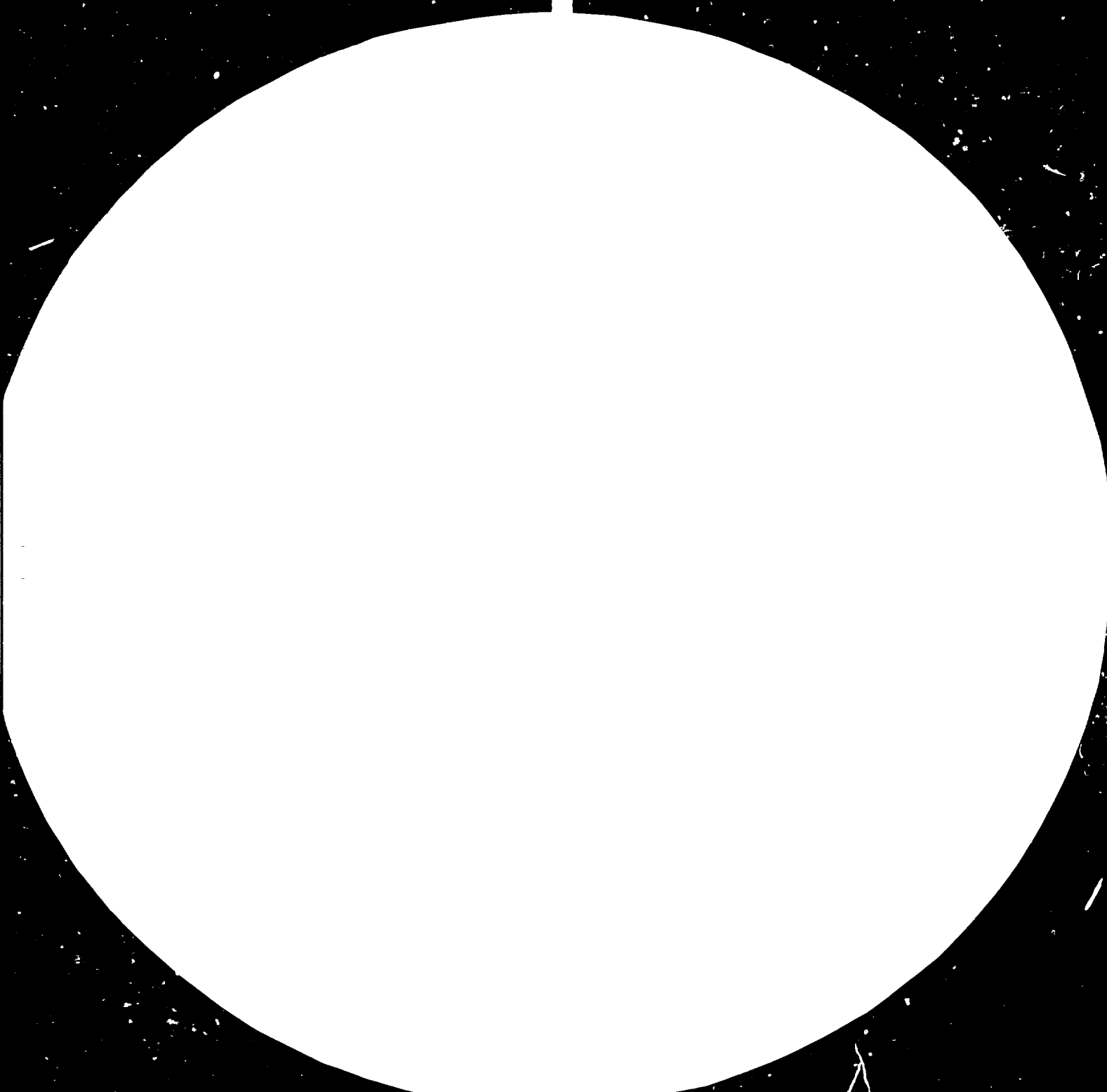

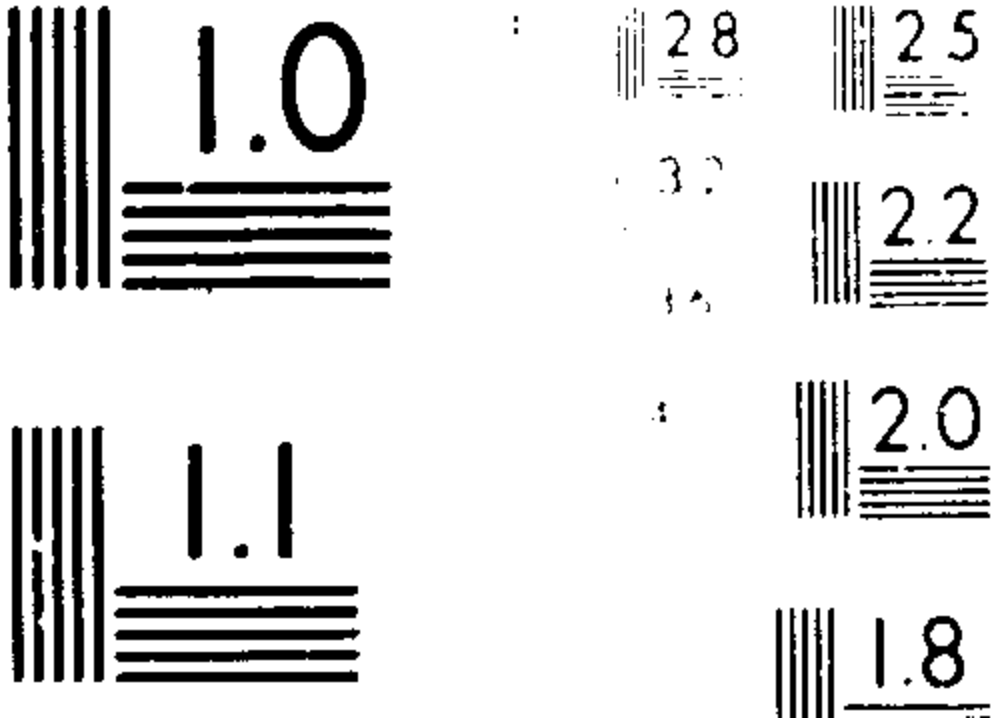
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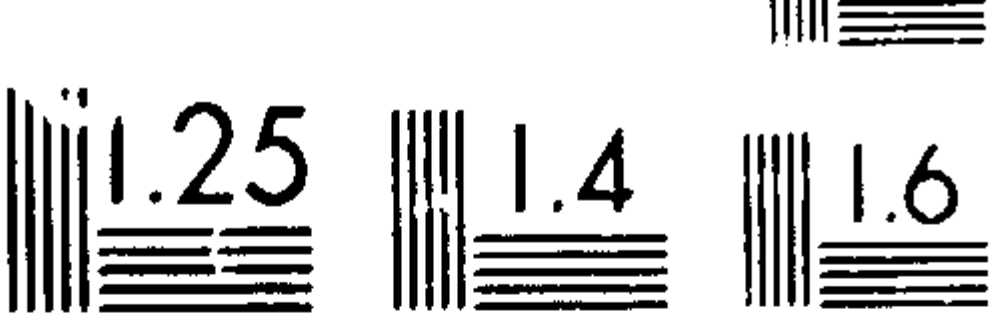
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CARIBBEAN ELECTRONICS INDUSTRY: PROMOTION, PARTNERSHIP AND PROSPERITY*

by

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1. SUMMARY

Electronics manufacturing in the Caribbean was successfully promoted, and expanded rapidly during the second half of the 1970's with attendant employment and foreign exchange benefits. Continuing advances have recently been partly offset by setbacks, however, and competitive strength for the longer term is uncertain because of technological and socio-economic trends.

This paper asserts that the industry's future need not - and should not - be left to the market place alone. A dynamic partnership between public and private agencies is required to identify and execute practical tasks to ensure that electronics manufacturing becomes firmly and profitably rooted in the Caribbean.

2. IMPORTANCE OF THE CARIBBEAN ELECTRONICS INDUSTRY

The Caribbean Governments are committed to work for the elimination of poverty and unemployment, and for equitable distribution of wealth and income. Many of them have found through experience that participation in the electronics industry can make a substantial contribution in a relatively short time. Some of the positive features are:-

- Expensive time-consuming feasibility studies are not needed.
- Employment is substantial: electronics manufacturing units absorb unskilled unemployed people in blocks of hundreds, and the build-up time is relatively short.
- The potential supply of jobs is effectively "inexhaustible", since the Caribbean labour pool is small compared with the size of the industry globally.
- Transport problems are relatively simple since the products are compact, light-weight and high-value.
- The global electronics industry is rapidly growing; it is a high-status "wave of the future", sophisticated in total but understandable in its elements. Working conditions are pleasant, pay relatively good: employees are generally happy.

3. EXPERIENCE IN BARBADOS

The national development plan for 1979-83 aims at economic diversification through "continued structural transformation of the economy and through the development of a more diversified pattern of manufactured goods and services". The strategy chosen to achieve this objective calls for "increased emphasis on attracting capital and on promoting increased skill- and labour-intensive industrial activities".

Based on this strategy - which has now been implicitly operative for a number of years - the Government embarked on a vigorous campaign to attract foreign investment through its well-established Industrial Development Corporation (IDC). The campaign includes the commissioning of a specialized promotional study entitled "Operating An Electronics Plant in Barbados", which was first distributed in 1977. IDC's efforts have succeeded in securing the construction of more than a dozen plants assembling or fabricating electronics items for export, including a new Intel plant with a capacity to employ 1,200 workers. Products include amplifiers, transformers, wire-wound resistors, silicon chips, etc and a wide variety of production processes are involved. Productivity is generally good: one plant manager reported that an operation requiring high visual acuity and manual dexterity is being performed with greater efficiency in Barbados than in either the Company's home country or in another developing country location. (That Company is considering the establishment of additional units - for different products - in Barbados and elsewhere in the Eastern Caribbean.)

In view of the expanding importance of the industry, IDC has established an electronics industry committee, comprising officials of both public and private organizations to discuss ways and means of assisting continued progress in the field. Furthermore, IDC acknowledges that the development path is not uniformly positive. In a speech dedicating a new TPW plant during February of this year, the IDC Chairman,

Dr Richard Cheltenham, said:[1/]

"As far as the electronics industry is concerned, we appreciate that/is a highly dynamic, highly competitive and rapidly /it evolving industry which is acutely sensitive to economic and technical considerations. And in periods of economic recession and rapid technological change (such as we are currently experiencing) low skilled jobs are the first to go.

CLOSURES

"This explains why last year two electronic plants closed in Barbados with consequential loss of jobs. For the benefit of the public, I think that these closures ought to be put in perspective. They do not mean that the electronic industry is not good for Barbados. Quite the contrary is true. Electronic constitutes a form of light manufacturing activity which is directly suited for Barbados. But the lesson of the closures is clear.

STRATEGY

"We must, as a conscious and deliberate strategy, try to attract companies that invest heavily in research, keep in the frontiers of the industry and are unlikely to be easily overtaken by technological advances. In addition, we must concentrate on companies that offer jobs of high technology which are better able to withstand the harsh wind of recession.

"But it takes time to move from a family of low and medium level of technology electronics industry to one of high level technology. And whilst this transition is taking place, we may, from time to time, see more closures. But that is part of the price we must pay for progress in industrial development.

"What I wish to emphasize is that we at IDC are doing as much as our resources will permit to ensure that the companies and the product lines we attract to our shores are such as will be with us for a long time."

1/ As quoted in the Nation, February 27, 1981

Dr Cheltenham was also reported 1/ as saying that:

> "The wage rate in Barbados is increasing faster than that in other competing countries and this may diminish the island's attractiveness and ability to compete for job producing industries." 2/

This trend is understood to be the principal factor motivating IDC's current efforts to attract higher-technology electronics industry to Barbados.

1/ In a page-one article of the Sunday Advocate-News, 8 February 1981.

2/ A large Motorola plant was recently won by Sri Lanka, which has only lately begun a promotional campaign.

4. EXPERIENCE ELSEWHERE IN THE CARIBBEAN

Preliminary information indicates that other Caribbean countries - among them Montserrat, Antigua and St Lucia - have generally positive experience (though not always unmixed) with electronics firms and are continuing to promote further foreign investments in that field. St Lucia in particular appears to have had good results from an active promotion campaign; its several electronics firms include one plant producing circuit boards for a highly successful electronic game. (However, this plant is now reported to have closed down) In Montserrat one of two plants is a 100-employee branch of a Boston-based company owned and managed by Montserratians. The company does sub-contract work for various major manufacturers, including the assembly of cable harnesses and pin-connectors. The firm is currently planning another larger facility to be located in nearby Antigua. Very sizeable contract operations are also carried out in Haiti.

All in all, a preliminary desk survey conducted by the UNIDO office in Barbados identified 38 plants in the Caribbean, many with plans announced for expansion.

5. Dynamics of International Competition: The Case of Singapore

As recently as 1975 a United Nations study on offshore operations and international trade in electronics between developed and developing countries [1/] did not even mention the Caribbean. The principal participants at the time were identified as singapore, Republic of Korea, Malaysia and Hong Kong. In reference to Singapore which led the field in employment, with 24,000 jobs, the report said:

> "The case of Singapore may serve as an illustration of a recent change in industrial policy in electronics, starting with the usual undifferentiated promotional "incentive package" and then moving on to a more selective development-stimulating approach. During the past decade, the priority objective in Singapore, as in most developing countries, was to absorb the plentiful low-skilled labour. This objective was achieved by 1972-1973 through the promotion of labour-intensive assembly operations, particularly in electronic components. More recently the governmental policy put greater emphasis on skill and technological contents. This policy was developed along the following lines:
>
> (a) Restriction of incentives, which are now granted selectively only to those operations that introduce a higher level of technology. For example, the firm Hewlett-Packard is no longer given tax incentives in connection with packaging integrated circuits, but it did secure tax concessions for the production of electronic calculators.
>
> (b) Dissuasion of firms from establishing mere low-skilled assembly plants in the country and Government pressure brought on firms already in operation, inducing them to up-grade such processes or leave the country.
>
> (c) Intensification of Government efforts to promote industrial training. In line with such efforts, and with the growing availability of local medium-skilled labour, restrictions are now introduced on the entrance of expatriates of such level. However, the "open door" policy is maintained for highly skilled expatriates not readily available locally.
>
> (d) Participation of the Government in joint ventures with technologically advanced foreign firms. This participation is intended to induce certain medium-size highly specialized firms of developed countries - which sometimes have no experience in international subcontracting - to start offshore operations.

1/ International Sub-contracting Arrangements In Electronics Between Developed Market-Economy Countries and Developing Countries, UNCTAD, Sales No. E.75.II.D.17

This new policy has already contributed significantly to the upgrading and diversification of the electronics industry in Singapore."

To bring the example up to date, the most recent annual report [1/] of the well-known Singapore Institute of Standards and Industrial Research (SISIR) provides an indication of the direction in which the country's electronics industry has been moving since 1975. The following brief extracts are illustrative:

> The new industrial strategy for the eighties will involve an upgrading and restructuring of our economy to produce higher value-added products and services. The trend is to move towards higher-technology and capital-intensive industries.
>
> .....
>
> The testing and consultancy services of the institute continued to form the bulk of the institute's activities (during the period).
>
> .....
>
> The Institute also upgraded its facilities in the electrical/electronic testing laboratories as more electronic products had to be tested to facilitate export to developed countries.
>
> .....
>
> The emphasis of the Institute's R and D programme will, for a start, be on quality improvement in locally made products, research on the reliability of these products and development of new products.
>
> .....
>
> SISIR will also concentrate its efforts on developing its expertise in other selected areas where there is increasing demand from industry such as the development of specialized centres in production technology. These centres will help industries reduce their financial and operational costs through the provision of prototype development, batch production and pilot plant facilities. SISIR's UNDP-assisted Applied Metrology Programme has also been extended for another three years to 1981. The two major fields selected for development under this programme are Microelectronics and Numerical Control (NC) Machine Technology.
>
> .....

1/ Annual Report 79/80

The Institute will continue to establish links with more technological organizations overseas in the coming years for mutual benefit.

.....

Venture capital will be needed to start off business projects as this is the only way that will turn technical inventions into reality. Local industries will be encouraged to participate in these projects. SISIR's wholly-owned subsidiary, SETSCO Pte Ltd may represent the Institute's interests in some of these projects, should joint ventures be established with industry for commercialising a product or process.

.....

The key to the success of the Institute's programmes is manpower. To complement this, (multi-disciplinary group of technical specialists) SISIR will also continue to develop business managers to commercialise R and D results, staff to identify new needs and professionals to manage the Institute's programmes.

.....

Plans are now under consideration for the institute to move into the proposed Science Park which will be sited near the University at Kent Ridge.

Thus, apparently, the strategy for the electronics industry articulated during the early 1970's has been pursued consistently. It appears to be fully reflected in SISIR's current programmes, which include consultancy, information, contract R and D and industrial design services as well as a full range of quality assurance activities. The Institute even initiated the Singapore Quality Reliability Association (SQRA) as far back as 1971 and the Association of Electronic Industries in Singapore (AEIS) by 1973.

6. CARIBBEAN PROMOTION REQUIRES SPECIALIZED BACKUP

Keeping in view the trends identified by Dr Cheltenham and the five to ten year head start built up by Singapore and several other electronics competitors, what can be said about the requirements for the Caribbean, as a relative newcomer, to ensure that its recent hard-won gains can be added to and counted on as long-term economic assets ?

First of all, there is an uncomfortable perception that the foreign firms could depart even more rapidly than they came, and create economic and political chaos in so doing:

- The current relatively low employment cost is largely responsible for bringing in the plants. Yet wage and benefit costs are inexorably rising.
- Most of the jobs so far do not require special education or long training. They are therefore "footloose".
- Most of the jobs are designed primarily for women; this has important social implications which may contribute to rising crime rates.
- There are relatively few and weak linkages among the plants or between the plants and the economy as a whole. Nearly everything is imported and then re-exported after manufacture or assembly.
- With some notable exceptions, top level managerial and technical personnel are foreigners.

Further, as the companies gain experience in the Caribbean, and as their business needs evolve through the dynamic change and growth inherent in their industry, they perceive limitations in their new relationships. For example:

- It is very costly to maintain foreign executives and technical people away from the parent location, thus there is a strong

incentive to recruit Caribbean nationals for those jobs. But there is clearly a supply gap that will take years to fill.

- There is also a growing need for technicians and first level supervisors but the output of training institutions is not yet adequate.

- Supporting services and supplies are not always obtainable. For example, an air-conditioner may have to be scrapped because its compressor unit cannot be re-charged locally. Packaging material of consistent standard is often unavailable. Printing services are considered uneconomical.

- Administrative procedures related to currency transactions, import/export operations, residency permits and the like tend to become more and more burdensome and partially offset the positive effect of services rendered by IDCs, etc.

By implication then, selective promotional techniques, such as those being employed by the Barbados IDC, must be complemented by intensive and coordinated development of manpower and supporting services. It could almost be said that the Caribbean - and Barbados in particular - stand at the point of electronics industry development where Singapore was in the early 1970's - a decade ago. But this would be too pessimistic an assessment, for many reasons. Still, in terms of human and institutional development there is a long way to go.

7. PARTNERSHIP FOR ELECTRONICS INDUSTRY DEVELOPMENT

It is widely agreed that in order to remain economically competitive, in view of advancing wages and benefits, Caribbean people will have to contribute more value to the products with which they work. This implies a continuing urgent need for greater local (Caribbean) involvement in the technical, creative and entrepreneurial aspects of the industry, in addition to stepping up the supply of manpower and supporting services, as discussed in Section 6 of this paper.

Of course, the Caribbean is not without considerable resources to define and embark on such a determined course. In addition to the nucleus of trained staff in the companies already operating, a number of secondary and tertiary institutions are already producing people trained in electronics skills and are being further developed. There are research institutes and engineering firms with highly skilled staff. Some manufacturing companies have located skilled Caribbean nationals overseas and have induced them to return to take up newly available challenges.

An important nucleus of local creative talent for design and application of electronic products already exists. For example, a "microprocessor club" in Jamaica comprises professionals at the University of the West Indies, the Scientific Research Council and one of the principal engineering consulting firms, among others. CARIRI in Trinidad has a well established electronics division. Their activities are already leading towards economically important results in the control of industrial processes and the production of energy from geographically dispersed renewable energy systems.

Following this line of reasoning, it appears that conditions are now opportune for the Caribbean - perhaps led by Barbados - to capitalize on the area's newly established economic momentum in electronics manufacturing. This can be done by defining and implementing a determined development programme aimed ultimately at stepping up local involvement in the creative

technical and entrepreneurial aspects of the electronics and allied R and D based industries. To make such a programme fully effective, it must be built upon a broader base of human and material resources than those available to Barbados alone. For this reason, among others, the programme should eventually involve other Caribbean nations as well as regional [1/] and international organizations.

And the programme must reflect a partnership between public and private agencies based on mutual advantage. Its targets or objectives may be conveniently developed in two groups as follows:

Group I: Training and Support Services (for immediate and intensive action)

- Accelerate growth in the supply of qualified technical and managerial manpower for existing and future electronics firms through formal and informal training activities, "reverse brain-drain", etc.
- Improve the availability of supporting and service facilities such as repair and maintenance, packaging supplies, printing services, industrial design, etc. [2/]
- Mobilize existing human and institutional resources within the broader Caribbean and internationally, to focus technical and managerial skills and multiply their effectiveness in achieving the above objectives. This includes strengthening the institutional framework for cooperation and pooling of resources.

1/ Please see potential list of institutions in Appendix

2/ For example, it is understood that the Barbados Development Bank has retained a consultant to help identify opportunities for electronics "linkage industries".

Group II. R and D, Entrepreneurial Initiatives (for appropriate action after investigation of feasibility)

- Progressively increase the value-added content of the industry through greater local technical and entrepreneurial involvement both in production and in product design and R and D activities. This should, inter alia, improve long and short range prospects for employment (including male employment), increase foreign exchange generation and add to Government revenues.
- Promote establishment in the Caribbean of R and D facilities associated with foreign-based electronics firms, as well as locally based units.
- Stimulate broadening of the existing industrial base and upgrading of jobs through encouraging and/or sponsoring design and prototype development of products destined for regional as well as extra-regional markets (including, inter alia, products related to improving performance of such important activities as sugar production and renewable energy programmes).

An approach towards defining and implementing a programme along these lines has already been suggested and outlined in a draft project document; terms of reference for a more detailed formulation exercise have been prepared and possible funding is being discussed.

The main conclusions to be drawn from the evidence [illegible] us - as seen from a Caribbean vantage point - are:

(i) that the electronics industry is a very important development vehicle and deserves high priority;

(ii) that international competition is such that long-term success demands that a systematic manpower and support programme be organized to complement the on-going promotional activities.

Of course, UNIDO is prepared to cooperate with Caribbean Governments and regional institutions in all of these areas, within its means.

Further, in addition to the Utrecht seminar, UNIDO is organizing a global Expert Group Meeting on micro-electronics, to be held later this year in Vienna. One result of these activities may be international cooperation assisting developing countries - including the Caribbean states - to benefit fully from the dramatic world-wide growth of the electronics industry.

8. APPENDIX

Partial List of Regional (and Selected National) Institutions Potentially Involved in Caribbean Electronics Industry Development

CARIRI	- Caribbean Industrial Research Institute
CARICOM	- Caribbean Common Market
ECLA	- Economic Commission for Latin America (Caribbean Office)
CDB	- Caribbean Development Bank
TEU	- Technology and Energy Unit (CDB)
CCST	- Caribbean Council for Science and Technology
CTCS	- Caribbean Technological Consultancy Service (proposed)
SRC	- Scientific Research Council (Jamaica)
UWI	- University of the West Indies (Faculty of Engineering)
CAIC	- Caribbean Association of Industry and Commerce
BIMAP	- Barbados Institute of Management and Productivity
CARICAD	- Caribbean Centre for Development Administration
IDC	- Industrial Development Corporation (Barbados)
ECCM	- East Caribbean Common Market
CCEO	- Council of Caribbean Engineering Organizations
BNSI	- Barbados National Standards Institution
JBS	- Jamaica Bureau of Standards
UNA	- University of the Netherlands Antilles (Faculty of Engineering)
UG	- University of Guyana (Faculty of Technology)
BMA	- Barbados Manufacturers Association
CARDEC	- Caribbean Electronics Industry Development Centre (proposed)