



TOGETHER
for a sustainable future

OCCASION

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



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

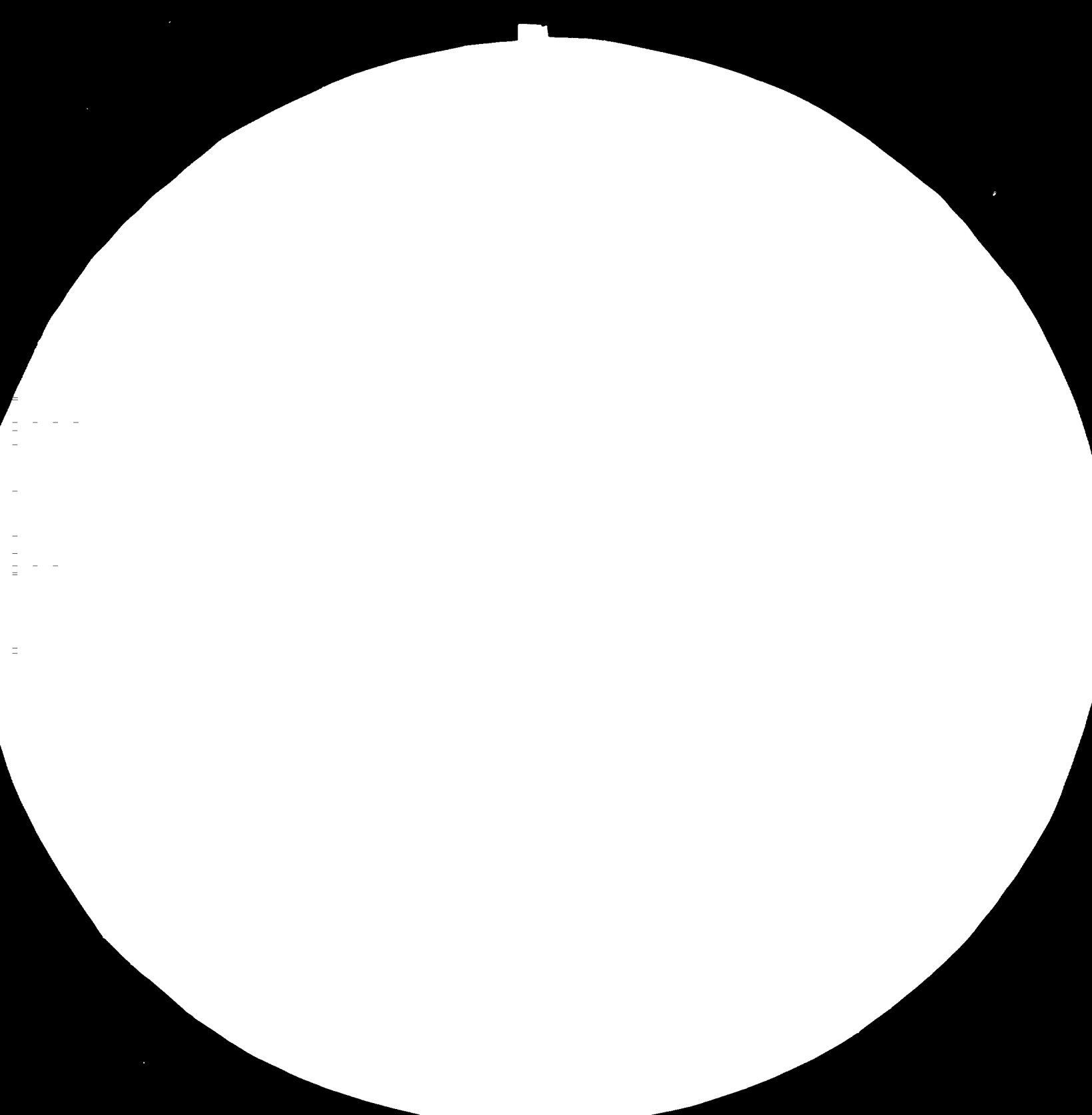
FAIR USE POLICY

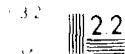
Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

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

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





MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

12775

1161 10/19/83 O. J. Costa Filho

1983

REPORT ON THE POSSIBLE CONTRIBUTIONS FROM BRAZIL TO THE MEETING ON THE IMPLICATIONS OF MICROELECTRONICS AND INFORMATICS FOR THE ECLA REGION.]

There is a growing consensus on the importance of the "information revolution" for the process of development. Behind that consensus, nevertheless, lie many differences of opinion on the actual implications of that revolution and, above all, on the forms of action to direct and control that process. Brazil is no exception to that and the definition of a set of policies on the field of informatics has been a slow and contradictory process, expressing at the same time the often uneasy confluence of very different interests favouring positive action as well as the very strong pressures in favour of "abstention".

Indeed, the single most important aspect of the Brazilian policy of informatics - the creation of a market reserve for the national capital with a potentially national technology in the segment for mini- and microcomputers and ~~the~~ peripherals, for equipment for the transmission and transcription of data and for terminals - was only possible through an "unorthodox" combination of factors: a crisis in the balance of payments, growing concern within the armed forces about the national security and defence implications of the informatics, realisation by sectors of private Brazilian capital of the potential for growth in the area, diffuse nationalistic feelings among sectors of the state bureaucracy and the scientific community, enough skills and experience within the scientific community to deal with the challenge and consensus within it on the basic needs for the development of the sector, etc. At the same time, such an initiative has met with strong opposition and criticism, especially from the multinationals.

The study of the Brazilian experience can be extremely relevant for any analysis of the implications of micro-electronics and informatics for developing countries. Not that Brazil is a representative case of a developing country - which it is not - but as a trial experience. In fact, unlike most of the less developed countries, Brazil has achieved a level of industrialization and economic development in general that makes it both necessary to take action in the field of information technology as well as possible to do so with better bargaining leverage to defend a higher degree of technological autonomy vis-a-vis the developed countries and, in particular, the multinationals.

This is not the place for an analysis ~~of the development~~ of the Brazilian state and the logic of its intervention in favour of autonomy. Suffice it to say that it expresses a complex set of international and national interests and pressures, (including the state's own interests and the pressures within it) that has lead only too often to situations of impasse in terms of policy making and big gaps between the implicit and explicit policies.

It is only towards the end of the 1960's that the Brazilian state defined for the first time an explicit policy on science and technology (Strategic Programme for Development - PED - 1968). Special financial mechanisms were established to support scientific and technological activities and an institutional structure was created to plan the area, producing two basic plans for the development of science and technology (PBDCT) for the periods 1973-74 and 1975-79 respectively. The explicit emphasis in these plans became increasingly one of stressing the role of science and technology in the process of Brazilian industrialization and development and in the strengthening of the national enterprise.

Toward the mid 1970's, 0.5% of the G.N.P. was allocated to the development of science and technology which, despite being low in relative terms, was already equivalent in absolute terms to the public expenditure on this area in countries like Sweden and Holland. A considerable amount of these resources - expressing the precariousness of previous development in the area - has been directed towards the training of people for research and the creation of an institutional infrastructure for research and development.

The main recipients of these funds have been public institutions but special programmes were also created to channel resources to the national enterprises for the adaptation of imported technology and the local development of technological innovation. The proportion of money involved in these programmes was relatively small but it is significant that most of it went to the sector of capital goods and intermediate goods, especially the industry of electronics and communication and the industry of aeronautics. Indeed, these are the two sectors with the highest consistency over time in terms of the explicit aim of the technological policy - i.e. to increase the technological autonomy as a way of increasing competitiveness of national enterprise - and the implicit directions of the economic policy - import control, market reserve, direct subsidies, etc. The state has also been using its considerable buying capacity to boost these national industries.

It is interesting to note that the sectors where the policy for technological autonomy has been more successful - minicomputers and aeronautic material - were new sectors not previously covered by foreign companies. Also relevant is the fact that both sectors were considered by the Armed Forces as strategic for the national security. It would be misleading to reduce everything to a question of military interest but it has undoubtedly played a major role. In fact, the first ideas about national control of digital technology started within the Navy at the end of the 1960's. In 1971 a Special Working Group was created by the Ministries of Navy and Planning with the task of building the prototype of an

electronic computer to be used in naval operations.

In 1972, a Commission for the Co-ordination of Electronic Processing (CAPRE) was created. From the initially restricted aims of rationalizing the use of computers in the public administration CAPRE increased steadily its powers to become, in the mid 1970's, responsible for the control of imports in the area of computers and other equipment for data processing (1975) and for the formulation of the state policy in this field (1976). This change takes place in the context of a shift of emphasis within the state plans: from the aim of strengthening the process of import substitution in the area of electronics in association with foreign capital (one third private foreign capital providing technology, one third private national capital providing managerial skills and one third state capital providing financial and political support) to the explicit aim of favouring national capital (predominantly private) as a necessary condition - even if insufficient - for technological autonomy.

The idea that the segment of minicomputers should become the platform for launching the national industry of digital electronics was very much in the air since 1971 with the creation of GTE. Nevertheless, it was not until 1977 that CAPRE decided in favour of exclusivity of national capital with non-renewable foreign technology. Of the sixteen projects presented to a public tender, three were selected with 100% national capital and technology from Logabax, Fujitsu and Nixdorf. IBM, who at the time were pushing for the production in Brazil of its system /32 was at the head of a strong and at times very aggressive campaign against CAPRE's decision and general policy of creation of a reserve for a certain segment of the market.

By 1980, thirteen national enterprises were already established in the space of that reserve, six of them directly involved in the production of mini- and microcomputers, with a production in the period 1978-80 of 1675 units and the control in 1980 of 17% of the overall Brazilian market for computers. Nevertheless, the success of these policies depends less on the initial decision and more on the consistency of its implementation over time. At a

time when the first few nationally designed models are already reaching the market, the financial risks due to uncertainty about policy continuity are still high and add to the natural risks of investing unsuccessfully in research and development.

Indeed, by the beginning of 1979, a process of change started to take place and a working group was created by the government to review the situation of informatics on the assumption that CAPRE was not any longer the appropriate structure to have. The working group - comprised of representatives from the National Information Service (SNI), the Council for National Security, the Armed Forces High Command (EMFA), the Foreign Ministry (MRE) and the Secretary of Planning (SEPLAN) - concluded that given the strategic importance of the information technology, there was a need for a centralized body, articulating a wider representation of different departments within the government and with the attributes of defining and implementing a comprehensive policy of informatics. Paradoxically, CAPRE was criticized for its liberalism vis-a-vis foreign capital and for the lack of commitment to the creation of a national industry of semiconductors and components which, in the view of the working group, was a condition of technological independence. CAPRE was then dissolved and in October 1979 the Special Secretary of Informatics (SEI) was created with an even more nationalistic discourse, at least at the level of its explicit aims.

Nevertheless, in what was considered by many to be a "de facto" drop in the market reserve, SEI decided in August of 1980 to approve the production in Brazil of minicomputers by Hewlett-Packard and medium-small computers by IBM. By the end of 1978, IBM had already changed its tactics and decided to penetrate the reserve market from above with models that in terms of price and performance could very well undermine the market for mini- and microcomputers. Not only the segment of small and medium was considered by CAPRE as an area for future expansion of national enterprise, but the threat to the national industry of mini- and microcomputers would ultimately affect the development of a national industry of microelectronics - the explicit aim of SEI, but also the implicit objective of CAPRE - and other sectors such

as peripherals, software, etc. that strongly depend on the expansion of the production of final goods.

If CAPRE expressed a more genuine confluence of nationalistic groups and positions, but presented its aims in a more "covert" way, SEI in its turn became a more complex compromise of interests despite a more explicit nationalist discourse. CAPRE was very influenced by the predominant ideology of the scientific community at the time and its aims of going beyond the mere import substitution process and to generate a technological autonomy ("national engineering", as it was called) as a condition for an independent economic development. The meaning and projection of that independence was not always the same among its defenders but for all of them what was at stake was really an alternative model of industrial development, even more so considering the strategic importance of the information technology. For this group, the national character of the capital and the technology was a condition to control and direct the impact of informatics and microelectronics in society.

SEI, nevertheless, would seem to be more permeated by a sense of pragmatism that tries to combine the search for specific objectives both political and military as well as economic (more than overall alternative strategies of development) with what a Brazilian industrialist described as the need to act as a "cushion" between the government and the pressures of the strong interests involved in the world of informatics. Ambiguously immersed within these limits, SEI has made important concessions to multinationals (like the one already mentioned) as well as kept to central aspects of its policy proposals.

One such an aspect is the one of microelectronics, indeed the most important area of SEI's activity at the moment. The decree creating the industry of microelectronics was approved in March of 1981 and after careful preparation, two industries - with capital from two powerful national financial groups: Itau and Docas de Santos - should have started working in February of 1982 in the city of Campinas. These industries would have started working at the same level as most of the multinationals operating in this sector in Brazil - i.e., encapsulating imported parts and components

This will be the first attempt to develop technological autonomy in an area where multinationals are operating. Without a market reserve "strictu sensu", but relying on import control and the possibility of fiscal and financial incentives, SEI hopes to create in the medium run the conditions for a competitive industry with the control of the complete cycle of production of microelectronics and capable of supplying the multinationals with its parts and components. The main incentive to private capital in this area is an internal market currently estimated at 200 million dollars.

A central role in the development of this programme will be played by the recently created Institute of Microelectronics Technology at the University of Campinas, with a budget of 10 million dollars to operate in the next three years. This is the first attempt on such a scale to bring closely together ~~the~~ industry ^{of INFORMATICS} and the university. It opens at the same time interesting new avenues to explore in terms of policies for training and research. In fact, this is a crucial problem about which a lot has been said but not much has been done, especially considering the evolution of the national industry of informatics and its new needs and requirements. If anything, this industry has absorbed a substantial part of the not very large academic community without, at the same time, generating an autonomous capacity of training and research. Strong state co-ordination and financial support will be needed to bring the articulation between the industry and the university to a new qualitative level.

Perhaps one of the most interesting aspects to observe in the near future will be the development of national software-houses. To a certain extent, this will be one of the best indicators of the degree of consistency of the overall policy of informatics and of technological autonomy. The government has nevertheless been slow in defining a strategy for the area. From the complex questions of how to control the import of software and what to import to the problems of how to establish a common language for the national minicomputers, there are still important definitions to be made. Meanwhile, several small companies are active in the area, fighting for survival and waiting for a better share of an immense potential market. In the field of process control alone - an area "intensive" in software that is establishing itself rapidly in Brazil and that

could benefit very much from a national software - there is a potential market of no less than one billion dollars in the next decade.

Finally, the one aspect of the Brazilian policy of informatics that strikes for its weaknesses and inconsistency - especially when confronted with the more nationalistic discourse and ideology - is the lack of any analysis on the impact of informatics and microelectronics in the society as a whole. There is no official analysis of the impact so far nor of future tendencies. One is lead to believe sometimes that if the industry and technology is national, everything will sort itself out spontaneously, and will be better and more balanced... The little that has been done on the impact of informatics has been elaborated within the universities and deals mainly with two issues: labour process/employment and privacy.

Perhaps it is premature to make a full evaluation of the relatively short and often contradictory history of informatics in Brazil. Nevertheless, there is already an extremely rich experience to be analysed. This very brief report does not aim to do that, not even to provide a comprehensive presentation of the problem areas. We have only tried to call attention to a few instances and aspects of the Brazilian experience so as to be able to identify what, in our view, is the most interesting and central question on which to concentrate: the importance of a national industry and technology of informatics for the direction and control of the impact of informatics in the process of development. Such an analysis could also try to advance some ideas on the implications of nationalisation for the process of concentration of the information technology in a few multinationals and advanced countries as well as its potential for a redefinition of the relations between developing countries on the field of informatics.

LIST OF PEOPLE INTERVIEWED IN BRAZIL

Meetings were organized with a series of persons considered to be representative of the not very large Brazilian "community of informatics". The group includes policy makers, representatives of the private industry of informatics and academics, and is formed by people that were and/or are very influential in the relatively short history of informatics in Brazil. The list, by cities, is as follows:

Brasilia

Cel. Edson Dytz - Undersecretary of Strategic Activities of SEI
 Jose Rubens Doria Porto - Co-ordinator of the Area of Microelectronics of SEI
 Arthur Pereira Nunes - Systems Analyst of SEI (participated in CAPRE as well)

Rio de Janeiro

Ivan da Costa Marques - Director of the Brazilian Enterprise of Computers and Systems EMBRACOMP S.A. (participated in CAPRE)
 Mario Dias Ripper - company Docas de Santos (participated in CAPRE)
 Fabio Estefano Erber - economist, lecturer at the Institute of Industrial Economics at the Federal University of Rio de Janeiro (UFRJ)
 Ricardo Tauilly - engineer, lecturer at the Institute of Industrial Economics of the UFRJ

Sao Paulo

Claudio Mammana - lecturer at the department of Nuclear Physics of the Institute of Physics at the University of Sao Paulo - USP (participated in CAPRE and SEI)
 Silvio Paciornik - Director of the Association of Professionals of Data Processing - APPD and lecturer at the Department of Nuclear Physics of the USP (participated in CAPRE)
 Edson Fregni - President of the Brazilian Association of Industries of Computers and Periferics - ABICOMP and owner of SCOPUS S.A.

Porto Alegre

Ricardo Saur - President of EDISA Electronica Digital S.A. (General Director of CAPRE from 1972 to 1979)
 Raul Papaleo - Director of Production of EDISA Electronica S.A.
 Icleia Maria Terra de Oliveira - engineer of the Department of Planning of the Regional Bank of Development - BRDE

