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BRAZIL'S INDUSTRIAL POLICY: AN ASSESSMENT IN THE LIGHT OF THE INTERNATIONAL EXPERIENCE

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Foreword

This report is the final output of a UNIDO project to assist the Department of Industry and Trade in the Ministry of Economy, Finance and Planning in designing appropriate mechanisms and means for the implementation of the new industrial policy by demonstrating the experiences of other open-market economies.

The project included two components. First, a study tour to European and Asian countries and the United States of America by Messrs. L. P. Velloso Lucas, Director, and N. Tavares, Coordinator, Department of Industry and Trade, Ministry of Economy, Finance and Planning, that took place during the second half of April 1991. Second, a field mission integrated by F. Sercovich from headquarters (head of mission) and experts A. Amsden (New School for Social Research and M.I.T.) and M. Teubal (Univ. of Jerusalem), who visited Brazil during the second half of June. In February 1992, F. Sercovich undertook a brief follow-up mission at the request of the Brazilian Government in order to assess the progress of the industrial programmes and update the original report.

During the second half of 1991 important steps were taken by the new economic team to further the progress of the economic reform programme. The acceleration of the trade liberalization schedule, the definition of an active export policy and definite steps towards the settlement of the debt problem are among them. Others are mentioned in the text. Although, despite a prolonged recession, inflationary pressures are only now apparently beginning to recede, during 1992 important forward steps are planned regarding the definite settlement of the debt, the reform of the legal codes towards industrial property right, software, public service concessions, fiscal incentives for technology and foreign investments and modernization of the ports.

This report focuses on some relevant aspects of industrial policy implementation. As such, it could by no means intend to present an overview of the Brazilian industrial system nor does it overestimate the clout of industrial policy in the context of the complex variety of economic and social problems faced by Brazil.

This report draws on contributions by A. Amsden (on performance standards) and M. Teubal (on technological infrastructure). The mission members wish to thank both Brazilian government officials and private sector leaders for their co-operation.

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Glossary of Acronyms

BEFIEX:	Special Programme of Fiscal Incentives for Exporters
BNDS:	National Social and Economic Development Bank
CEC:	Competitiveness Commission
CNI:	Confederacão Nacional de Industria
DIT:	Department of Industry and Trade
FIESP:	Industrial Federation of the State of São Paulo
FINEP:	Study and Project Fund
TCP:	Technological Capability Programme
GEPS:	Sectoral Policy Executive Groups
INMETRO:	National Laboratory of Metrology
IPT:	Technology Research Institute
I&T Policies:	Industrial and Technological Policies
NIP:	New Industrial Policy
PBQP:	Productivity and Quality Programme
ICP:	Industrial Competitiveness Programme
PCT:	Technology Training Programme
PS:	Performance Standards
SEBRAE:	Brazilian Service for Micro and Small Enterprises
SENAI:	National System for Industrial Apprenticeship
SMSE:	Small and medium scale enterprises
TI:	Technological Infrastructure

1. Executive Summary

i. The Policy Framework

In June 1990 the Brazilian government launched a major effort aimed at readdressing the thrust of its industrial development process while gearing the economy along a path of stability. One of the main instruments for this is the New Industrial Policy-NEP, which consists of a set of guidelines and programmes that entail a sharp break with the past both in concept and practice.

Competitiveness is priorized over growth as the key policy objective. Subsidies are phased out, the state as an entrepreneur begins to withdraw leaving room to private initiative, and government action is constrained to overcome limitations of the working of the market. Market reserve is being eliminated. A trade liberalization schedule is being strictly enforced.

At the same time, the medium and long-term underpinnings of gains in competitiveness are being addressed. Skill formation, productivity growth, quality enhancement and development of technological capabilities are emphasized, particularly at the level of the firm. Major industrial restructuring aimed at increased specialization and the overcoming of technical and economic threshold barriers are facilitated. Transparent selectivity in favour of technology progress promoting sectors, particularly in the case of small and medium-sized enterprises and human resource development, is adopted as a criterion.

To achieve its aims, the NIP requires a new type of business-government relationship: ie., one focused not on subsidizing capacity creation and guaranteeing market access, but on consensually agreed schedules for attaining international competitive performance standards.

The mission members are in essential agreement that the aim of the NIP, ie. to increase competitiveness, as well as the programmes devised to achieve this aim particularly at the firm level, are rational and well founded in light of the world and Brazilian economies in the early 1990s. They believe, however, that there is room to improve the NIP's chances of success and to provide for more functional business/government relations by means not yet articulated in the NIP.

The objectives are clear and so are the instruments--at a rather general level. But some specifications are still missing--or too implicit and loose within the whole policy package. The 'detail engineering' of the industrial policy is still being worked out. This report aims at assisting in the spelling out of the fine tuning of the N.I.P., which does take stock of most frontier developments in the field of industrial and technological policies. In this *Executive Summary* we summarize these competitiveness-enhancing policy principles and provide suggestions for implementation. These are further elaborated later in our report.

ii. **Principles**

The impact of the NIP on competitiveness can be strengthened to the extent that the government introduces the following interrelated principles:

a. As a general rule, no support should be given to the private sector without the stipulation of concrete, unambiguous performance standards--PS from now on;

b. PS should be set so as to converge with best international practice and in such a way that they are achievable yet a challenge. They should result from a process of negotiation and consensus-building between the parties involved: ie., the enterprise and/or industry association; the government organization responsible for providing business with the support in exchange for which the PS are agreed upon; the government body responsible for monitoring the PS and labour. There should be a careful monitoring of the conditions under which said standards, if not attained, should be re-negotiated. The monitoring function should be delegated as far as possible. Through these procedures an environment conducive for the exchange of information among firms and between them and government agencies will be created.

c. There might be some benefits the government wishes to give enterprises under the NIP which would not have PS attached to them--eg., the reduction of taxes on purchases of capital goods. Generally, however, the mission is of the opinion that government should attach PS to all major forms of support provided to the private sector and to state-owned-enterprises (SOEs). The government has the chance to familiarize both SOEs and their suppliers with PS by means of its procurement function, such as Petrobras has been doing under the previous incentive regime. PS should be applied to the support the government provides firms in the area of technological capability development.

d. A simple demand-pull approach is unlikely to serve as a good enough guide to fill the vacuum created by the exhaustion of the mission-oriented approach to technological policy. This approach consisted of engaging in full scale development efforts in a rather broad range of selected sectors. The main trouble with it is the lack of accountability and sanction for failure. It also often entails an undue disregard for commercial prospects.

e. The adoption of a diffusion and network oriented technological policy approach is hereby recommended. De-centralized, co-operative, flexible and relatively inexpensive mechanisms to promote technology risk ventures should be part of that approach. It should aim at speeding up specific applications and scale-up engineering of generic technologies with a potential for a broad range of potential uses, and diffusing efficient production (including quality control) and product-related technology to firms of all sizes. This approach is entirely compatible with the role of the government in exploratory development, granting loans and setting risk-sharing schemes by focusing on financing time/cost trade-offs. A shift from subsidization of targeted sectors to infant technology development which might include an element of (temporary) catalytic financing or subsidization would thus take place. The general thrust should be one of shifting from big projects to many small projects and from government-driven to industry-driven projects.

f. A technological infrastructure ought to be established whenever the market for the outputs of a capability (eg, technical services) are non-existent or not clear. This means, among others, facilitating learning by using and learning by organizing technological development activities in order

to encourage market building. In particular, the need is clearly perceived to induce co-operation and networking among users regarding: (i) the setting of the technology research agenda; (ii) co-operating in information search and pre-commercial technology research project execution; and, (iii) learning about the usefulness of relying on the services of common technology capabilities.

g. A major bottleneck for initiating the process of transition towards a policy of emphasizing co-operative capability development is that co-operative projects are almost non-existent. They can only be generated by explicit effort and interaction among potential major users of the new capabilities. Individual firms are unlikely to initiate such an effort, except under very pressing circumstances. Therefore, this process should be initiated and financed by the Government, preferably with the co-operation of industry associations. Inertia and lack of experience is an obstacle here. However, if this obstacle is not addressed, important degrees of freedom in the industrial and technological (I&T) policy will be lost.

h. Synergies ought to be created among the different instruments used (financing, tax exemptions, etc.) and they should be made to work convergently towards the competitive standards pursued. Thus, for instance, after an initial phase, resources applied to quality enhancing programmes are likely to suffer more or less rapidly decreasing returns (an equivalent to 11 per cent of the GDP is estimated as being currently wasted). However, such a trend can eventually be countered if technological improvements, training and capacity creation are closely articulated with those programmes. In addition, the implementation of quality enhancement programmes at the firm level may often necessitate the establishment of relevant capabilities at the sector level.

i. Another basic requisite in the new business-government dialogue is the articulation between the short and the longer terms. The government is already linking short term (price) policy to longer term aims (like those relating to the PBQP). This is advisable as long as the latter are not compromised by the vicissitudes of the former. Although the linkage should exist, the achievement of medium/longer term objectives should be linked to rewards that are basically not dependent upon the very short term behaviour of the enterprises.[1]

j. Brazilian industry is going through a period of deep recession. Many investment decisions are held back. This particularly affects the allocation of resources to technological development and human resource formation. Steps ought to be taken urgently to facilitate firms taking advantage of the resulting slack in order to build up the skills and capabilities that will be needed during the next upswing. Counter-cyclical technological development promotion and training efforts should be strengthened during depressions, particularly in the wake of liberalization programmes.

iii. **Implementation**

Based on the above principles, the mission puts forward the following proposals and recommendations aimed at a more effective implementation of the N.I.P. under the current circumstances. They relate to three areas: I&T Policy Management; II. Training; and III. Information Search and Background Studies.

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[1] By the end of 1991 price controls had been substantially phased out, and a more realistic exchange rate has been established.

iii.i. **I&T Policy Management**

1. Within the Ministry of Economy, Finance and Planning, strengthening of the DIT by means of: (a) creation of more stable jobs; (b) articulation of clear career paths; (c) award of competitive salaries; and, (d) improvement in general conditions, particularly those relating to technical support. Unless these reforms are introduced, the DIC will experience a high turnover and will attract low calibre professional personnel.

2. The interface between BNDES and DIT should be strengthened in order to ensure that financial support to firms is made conditional on the introduction of PS. One way to do this would be by having BNDES personal participating in the sectoral commissions and actively assisting the DIT in applying results from industrial diagnosis surveys to policy-making. This closer co-operation would require, among other things, clearer orientations as to how the privatization programmes and the objectives of the industrial policy programmes fit with each other. The former programmes are neither purely financial operations nor an objective in itself, but should be viewed as tools to promote competitiveness and integration into world markets, while obtaining maximum value for the assets concerned.

3. To privatize optimally it is advisable to take steps towards bringing SOEs up to international levels of competitiveness as quickly as possible. This requires restructuring SOEs, subjecting them to PS, and introducing the same types of programmes to enhance technological capability, quality and productivity as in the private sector.[1]

4. The implementation and monitoring of PS must be accomplished by the government as simply and cheaply as possible. Towards this end, it may be worthwhile for the government not only to strengthen ties between BNDES and DIT, but also between these two and INMETRO, which may be instrumental in the development, implementation and monitoring of technical PS. As a vital part of the consensus-building process referred to above, the private sector should participate actively in the PS setting process.

5. Instead of searching for broadly defined "strategic" areas where capabilities could have numerous, albeit uncertain spin-offs in a wide variety of sectors, the concept of co-operative capability development should be tested in a preliminary, exploratory way in the policy formulation/implementation process by means of: (i) identifying relatively simple cases; eg. a routine type of capability required to solve a present problem today; and, (ii) financing any such search by a consortium of firms or by an industry association. Massive financing of early projects of this kind should be provided so as to trigger subsequent search/execution of co-operative capability development by the private sector.

6. More specifically, the government should announce that it would be willing to provide most of the finance needed for any "good", bonafide project of the kind being discussed. It would also exert pressure upon the industry associations to initiate "search" and to submit results to BNDES or other government agencies for financing. The latter is especially needed for traditional industry eg., generic technological development for tackling tanning industry contamination in the state of São Paulo.

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[1] By February 1992 the privatization programme was well on its way. Usiminas/usomec, CELMA, Mafersa and Cosinor had already been auctioned and other large steel and petrochemical SOEs were waiting in line.

7. The government should also initiate a "search" project for a sophisticated capability such as a "user-oriented" Microelectronics Design Center, which may also involve some limited production capability. Past policies have emphasized the building up of endogenous microelectronic technology-related capabilities. This was done at the expense of the development of a capability for effectively making use of world technology, with serious consequences eg., for the competitiveness of the Brazilian capital good industry. This proposal aims at correcting such imbalance. Similar efforts towards the development of design capabilities should be undertaken in other sectors such as footwear, plastics, textiles and metalworking sectors.

8. An Industrial R&D Fund should be set up as an indispensable ingredient for an entrepreneurially oriented informatics sector in Brazil, given the imperfections in its capital market and shortage of venture capital sources. The aim here is to generate a "swarming" effect of numerous new entrepreneurs entering R&D ventures in what should be a "collective" effort at generating innovation capabilities. Some of these firms will become viable in a few years, and their contribution to the economy may become substantial. The Fund should be created by FINEP or BNDES and managed according to principles that are spelt out in the main body of this report.

iii.ii. **Training**

9. Crash training programmes of key R&D and production personnel to be sent abroad for periods ranging between 1 to 3 months. The government should negotiate for as much foreign assistance as possible (say in conjunction with the repayment of its debt) to defray the costs of overseas training in foreign facilities of R&D managers, process engineers and first line supervisors to get "hands on" experience with state-of-the-art production in overseas firms. The industries in which foreign governments may agree to undertake training may not be in frontier areas, but might be in sectors with good world market prospects for Brazil.

10. There is an urgent need in Brazil for the introduction of programmes to help firms begin to treat their workforce as an asset, rather than as an unlimited and unvaluable free good. SENAI's services should be upgraded both in their capacity to serve firm-specific needs and in their flexibility of response across technical disciplines.

11. Another important objective is strengthening the I&T formulation and implementation capability of the country. This may include sending young graduates in economics, business, political science and engineering sciences to centers of excellence abroad to pursue specialized studies in the emerging area of innovation management and technology policy for periods between one and two years.

iii.iii. **Information Search and Background Studies**

Information search and background studies are recommended in the following six critical areas in order to tackle actual and/or potential bottlenecks in the implementation of industrial policy.

i. (a) The setting, negotiation, timing of introduction and monitoring of performance standards as a tool of industrial policy in selected industrial sectors. (b) Critical evaluation of the international and Brazilian experiences. (c) Necessary synergies among industrial policy instruments. Information, methodological, and skill

requirements. (d) Evaluation of technical assistance needs to help enterprises define their P.S. frontier and of the expected impact of economic and technical P.S. on gains in competitiveness.

ii. Assessment of industrial restructuring response times at the sectoral level, the corresponding trade liberalization schedules adopted and industrial policy focuses thereof;

iii. Operationalization of sectoral diagnosis studies for purposes of industrial policy making. Development of appropriate indicators;

iv. Identification of relevant generic technologies that cut across industry to be developed through co-operative efforts: institutional mechanisms, incentives, skill and financial requirements;

v. The design and application of I&T restructuring policy instruments at times of recession;

vi. The relevant international experience in industrial apprenticeship and training strategies.

In addition, relating to MERCOSUR, a multi-country study should be undertaken on prospective patterns of specialization within the sub-region in selected industrial sectors such as capital goods, automobiles, consumer durables, agro-industry and chemicals and related policies.

2. The N.I.P. in the Light of World Trends in Industrial and Technological Policy: Thrust and Instruments

i. The International Context

The Brazilian government launches its N.I.P. at a time when a rapid succession of pervasive scientific breakthroughs, new coalitions between trading partners, the spread of R&D operations and strategic partnership agreements across national borders, epoch-making changes in business management philosophies and evolving regulatory policies are imposing new rules on international competition.

Under these new conditions, co-operative ways of tackling raising threshold factors in R&D, the enhanced role of forward and backward linkages in production and marketing and new methods of skill deployment and labour organization induce discontinuities in competitive advantage across national borders. Governments strive to gear market forces towards building up national and/or regional advantage. "Market conforming", as opposed to "market-defying" methods of policy intervention are replacing the hands-on/hands-off dichotomy as the guiding principle of governmental action.

Major reshufflings, mergers and acquisitions are the order of the day, as are intra- and inter-trade bloc partnerships. The basic aim is to foster competitive strengths and to secure footholds in the emerging trade areas. Nearly three fifths of world trade takes place today within and almost one fourth between the three major trade areas, while trade between countries outside those areas accounts for a mere 13 per cent.

Direct foreign investment is flowing mostly within and between the three main emerging blocs in order to exploit mostly intra-bloc, up-market opportunities and guard against possible inter-bloc barriers. These flows involve new actors such as the newly industrializing countries of South east Asia, whose firms are actively engaged in a remarkable expansion of their international R&D, production and marketing operations.

. need for a finely tuned, consensual interaction between corporate strategy and government policy congruent with the spur of competition is widely recognized.

Advanced country governments are actively encouraging corporate R&D partnerships and promoting the development of pre-competitive, generic technologies by abolishing obstructive legislation, granting explicit subsidies and setting up specific institutional devices to encourage those involved to enter into competitive, albeit non-adversarial and co-operative relationships.

A pervasive trend towards the divestment of state-held assets is to be observed, along with a scaling-down of the welfare state, the aim being to constrain the role of the State as an entrepreneur and reduce the provision of services to a bare minimum. However, state enterprises in countries such as France and Italy are still important players. Indeed, they count as some of the most vigorous centres of entrepreneurial activity in the industrial restructuring process in the E.C.

Managed trade practices are proving to be a remarkably resilient way of gaining "breathing space" and securing national and/or regional competitive advantage, notwithstanding the increasing liberalized trade flows within

blocs. Measures to contain increasing market shares by Japanese automotive transplants in Europe are an example.

Leading industrial competitors are rapidly moving out of non-core product lines, turning towards specialization in increasing value-added activities and adapting themselves to serve the needs of differentiated market niches through product-tailoring. This involves organizational adjustments that have a bearing on all activities ranging from R&D to marketing, management, information and training schemes. In particular, they are showing increasing concern for--and involvement in--education and skill formation. The use of the dual apprenticeship system in Germany and on-the-job learning schemes is being generalized.

Both defensive and offensive endeavours to secure larger shares in the national and regional markets have led to a tightly knit network of corporate alliances among the major actors. These are ultimately aimed at global markets and entail either technological co-operation or other kinds of business arrangements.

The growth of innovative networks has began to permeate every country and spares no industry. By the late 1980s, no less than 80 per cent of all government R&D loans in Japan and two thirds of similar operations in the European Community were aimed at fueling such networks. National examples, such as Britain's Alvey Programme, clearly show the privileges that innovative networks enjoy in the ranking of policy priorities, even in the most liberal market environment.

Engineering research associations, downstream processing clubs, regional manufacturing centres, and other research, engineering and service networks have become keys to the restructuring of R&D and engineering activities in the OECD countries. They aim to overcome market failure, share high up-front costs, spread risks and pursue national and/or regional economic objectives.

Regional, district and contractor networks are being actively promoted. They are intended to reap latent economies of scope, promote synergy, exploit externalities including common infrastructural and marketing services, and enhance competitive flexibility, particularly among small-scale industries. The pervasiveness of innovative networks follows a clear trend towards the increasingly systemic innovative process in industry. Among the most outstanding examples of such a trend is the spread of Japanese subcontracting, production-sharing and supplier networking practices. Subcontractors are not longer seen as low-cost suppliers ready to absorb the shocks and bear the burden generated by business fluctuational, but as fully-fledged partners in the innovation process.

Experience with co-operation/competition schemes in the west has been varied. After much hesitation regarding the MCC, SEMATECH and HDTV consortia, the US government, led by Congress, is now apparently taking a firmer stand on S&T policy. Substantial budget increases for a variety of technology programmes have been approved. They include strengthening the Department of Defense's role in funding industrial research as well as the White House Office of Science and Technology Policy (OSTP) in its technology policy design and co-ordination work, including the setting up of a new Critical Technologies Institute. Since the Co-operative Research Act was passed in the US in 1984, more than 140 co-operative research ventures have been initiated.

In a new development, a "super-ministry" has just been established in France in a step likely to strengthen state-funding for high technology

industry and research. It brings the ministers for industry, trade and telecommunications under the unified command of the ministry of economy, finance and budget.

Over the next six years, the EC is expected to spend around $ 16 billion on developing a wide range of technologies through a series of joint R&D programmes such as Euroka, Jessi, Esprit, Race and Comet. The field covered include semi-conductors, mobile phones, computers, information technology, aeronautics, advanced materials and telecommunications. The largest among these programmes, Eureka has since 1985 launched 302 joint R&D projects with 1600 participating companies and a total budget of $10.3 billion (including $4 billion for the 8 year Jessi programme on semi-conductors).

To sum up: overall international trends in I&T policy point towards managed trade liberalization-cum-emphasis on promotion of technological change through direct support to the setting up and operation of innovative networks and interactive mechanisms ("technological infrastructure") whereby non-adversarial competitive rivals are induced to co-operate in broadly defined pre-commercial areas of endeavour which are deemed critical for the building up of national and regional competitive advantage.

ii. **The New Industrial Policy (N.I.P.)**

ii.i. The General Guidelines

In June 1990 the Brazilian government sanctions a shift from a growth-focused to a competitiveness-oriented industrial policy, centered upon restructuring industry, strengthening technological capabilities and facilitating technology diffusion.

The N.I.P. blends a neutral policy with a policy of transparent selectivity regarding some generic technology activities that serve a host of industries and enterprises. In this sense, Brazilian N.I.P. is in line with prevailing approaches in the OECD and South-asian countries as examined further above.

The general industrial policy guidelines issued on 26 June 1990 establish that market forces will be used in order to foster gains in the competitiveness of Brazilian industry by facilitating:

(i) industrial modernization;

(ii) the diffusion of more advanced technological standards and,

(iii) the development of technological capabilities.

These ends are to be pursued by means of:

(i) elimination of all non-transparent, non-equitable subsidies and promotion of domestic competition and reductions in tariff protection--which becomes the sole instrument of import policy. At the time when the guidelines were issued tariffs ranged between zero and 105 per cent, with a mean of 35 per cent. By 1994, the maximum tariff is set in 35 per cent, with a mean and modal tariff of 20 per cent. The 35 per cent tariff is to be applied only on temporary basis. It is anticipated that even higher protection may be exceptionally granted to new, high-tech industries;

(ii) withdrawal of the state as an entrepreneur, replacing this role by that of achieving macroeconomic stability and a conducive investment environment;

(iii) increased specialization;

(iv) planned exposure to international competition;

(v) development of technological capabilities at the enterprise level through selective tariff protection in high-tech industries and support of technology diffusion;

(vi) articulation between the financing of modernization and the strengthening of the technological infrastructure.

The future organization Brazilian industry is visualized in the guidelines as consisting of large industry groups that articulate a wide ranging web of technologically dynamic SMSE, while competing and co-operating with foreign enterprises in a variety of ways.

Official credits are to be granted only for projects relating to: (i) industrial restructuring; (ii) development of technological capability and (iii) expansion of foreign trade. In the case of capital good industries, lower nationalization coefficients than in the past are allowed, although keeping "satisfactory" domestic value added levels. Credit support to technologically dynamic, spare part and component producer SMSE is to be granted.

Government procurement policies are to be used to set and diffuse international standards and generating demand for high-tech industries and joint goverrment-private R&D projects.

Finally, domestic competition is to be encouraged through deregulation and legislation aimed at averting the exercise of restrictive business practices.

Three main mechanisms to enforce the N.I.P. are established in the general guidelines: (i) the PBQP; (ii) the TCP; and, (iii) the ICP. Let us now review them briefly.

ii.ii. The Quality and Productivity Programme (BPQP)

The PBQP was issued on 7 november 1990. It is intended to counteract the estimated 40 per cent of the industrial GNP that is lost because of quality deficiencies and to provide a key input for enhanced industrial competitiveness. It was conceived as a highly interactive and comprehensive mechanism addressed at the enterprises. It is managed under the direct jurisdiction of the Presidency of the Republic and provides strategic outlook and co-ordination to the host of specific sub-sectoral and project activities that are being carried out in a de-centralized manner. It aims at breaking infrastructural and institutional enclaves that retard progress in this field.

It comprises five kinds of promotional actions relating to: (i) awareness and motivation building; (ii) development and diffusion of modern quality and productivity-related management methods; (iii) human resource development; (iv) provision of technical services; and (v) institutional support.

A number of general and sectoral sub-programmes are being established under the National Committee of Quality and Productivity. At the time of the mission, four such sectoral sub-Committees have been formed: in informatics, capital goods, agro-industry and textiles. This sub-Committees are to formulate and submit specific action programmes.

As to how these programmes are to be financed, the PBQP is *not* designed to allocate resources directly. It relies basically on the resources of the enterprises themselves. However, it supplies guidelines to the financial and promotional agencies in their support of the different sub-programmes.

Within 15 months since the launching of the PBQP 240 private sector entities were participating and 21 "Diagnosticos de Eucuadramento" had been elaborated (including those in informatics, textiles, leather and shoes, automobiles, civil construction and toys). In addition a series of sectoral studies by the BNDES on the organization of production and quality management are being carried out. So far studies on automobiles, food processing and shoes have been completed. In December 1991 a Strategic Assessment seminar was held with the participation of 58 representatives from the private sector, labour and the Government. In this seminar 10 strategic guidelines for 1992 were set out (see Annex 10).

ii.iii. The Technological Capability Programme (TCP)

The guidelines of the TCP were passed on 10 August 1990 by an Ad Hoc Commission specially set up to that effect. They are geared to revert three trends considered anacronic in the context of the N.I.P.: (i) low overall expenditure in S&T (0.5 per cent of GDP against 2.3-2.9 per cent in the industrial countries) and, within it, very little devoted to industry; (ii) predominance of science, as opposed to technology-related applications, opposite being the case for the industrial countries; and, (iii) the private sector accounts for just 11 per cent of the expenditures, again a meager contribution when compared with that of Japan (70 per cent) and even that of Italy (30 per cent). Such a reversion is expected to take place according to the following schedule[1]:

	1990	1994
- R&D Expenditures/GDP	0.5%	1.3%
- Share of Industrial Technology on total R&D expenditures	30%	47%
- Private sector R&D on:		
- total R&D expenditures	11%	13%
- GDP	0.06%	0.17%
- Financing of R&D by specialized agencies (as % of GDP)	3% 0.01%	28% 0.38%

Among other things, the TCP also prescribes:

(i) creation of a Fund to support the "externalities" needed for the development of industry's technological capability;

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[1] Among other assumptions, these projections assume that R&D expenditures by private industrial enterprises will jump from 0% growth in 1990 to 35% growth from 1991 onwards. Such may be the case thanks to the fact that some of the biggest R&D spenders are among the enterprises being privatized.

(ii) use of the following criteria in the allocation of resources to build up technological capability:

(ii.a) degree of difficulty to get access to available technology;

(ii.b) speed of diffusion; and,

(ii.c) influence of market structures;

(iii) promote co-operation among large private and state-owned- and SMS enterprises;

(iv) support co-operative technological research through domestic and international consortia;

(v) encourage technological forecasting activities;

(vi) encourage foreign enterprises to carry out R&D programmes in Brazil and to hire the services of Brazilian technological institutes and universities.

The TCP also advice financial agencies to make their financial assistance or fiscal incentives conditional basically upon the adoption by the enterprises of:

(i) progressive increases in the allocation of their own resources to R&D activities;

(ii) engagement in technological and industrial co-operation with dynamic SMSE;

(iii) greater reliance on technological institutes and universities regarding applied research, experimental development and other technical services;

(iv) consolidation of in-house R&D, engineering, production and commercialization activities needed to create technological capability within the enterprise; and, "as far as possible".

(v) (*inter alia*) use of co-operative research through consortia and hiring of engineering consulting companies and institutes in development and technology transfer activities.

According to the TCP, preferential financial treatment should be granted to these activities and up to 70 per cent of the investments involved may come from public resources (credits or fiscal incentives).

ii.iv. The Industrial Competitiveness Programme (ICP)

The ICP provides further details on a number of definitions of the general guidelines. It renders posthumous homage to the "successful exhaustion" of the import substitution phase of Brazilian industrialization which, after three decades of above world average growth rates, placed Brazil as the ninth largest industrial economy in the world.

The approach now consists of linking the policy focus on gains in competitiveness with taking full advantage of the development of a large domestic mass market. While adopting a "systemic" approach of competitiveness,

the ICP ranks macroeconomic stability as the main "attribute" of the competitiveness of the economy.

Much emphasis is put on the need to reduce investment costs. This is to be achieved through tax exemptions, accelerated depreciation regimes, favourable energy costs, import liberalization, multi-year government investment programmes, reduction to 60 per cent in the rate of "nationalization" required in government procurement of capital goods, easier access to domestic financing by foreign investors, and creation of Investment Funds to complement BNDES resources.

At the same time, as far as corporate management is concerned, the programme calls for mergers and consolidations in those industries that still remain too atomized, de-verticalization of large enterprises with the corresponding development of specialized supplier networks, the incorporation of private enterprises and privatization.

The ICP states that, with the new policy framework, the concept of sectoral priority loses meaning. Instead, a criterion of non-exclusive selectivity is established. Such a criterion is aimed at unlocking and enhancing the competitive (and, particularly, export) potential of many industrial activities by breaking the conflict of interest between them as users and (protected) high technology producers as suppliers. This is to take effect by promoting fields such as those of microelectronics, biotechnology, new materials and fine chemicals whose products and services help to upgrade the technological standards of a wide variety of user industries. However, all direct intervention, incentive and subsidy mechanisms whereby risks are shifted from investors to the tax-payer are discarded outright.

The ICP introduces two important consensus-building institutional mechanisms. One is the CEC, responsible for supplying guidelines based on a prospective outlook of the different industrial activities and for overviewing overall competitiveness performance. It is constituted by representatives of 140 enterprises in sectoral groups of 10.

Once sector-specific problems are identified, meetings of the Executive Sectoral Policy Groups or GEPS (the second consensus building institutional mechanism) are convened.

The financial sector is not represented in these institutional mechanisms.

3. A prescription-oriented assessment

In what follows comments and proposals on aspects that the mission members deem critical to N.I.P.'s success are put forward. They are submitted under five main headings: (i) Consensual setting of performance standards-PS as a central tool in the reconstitution of government/industry relationships under the N.I.P.; (ii) A diffusion-oriented approach as a guide for the new I&T policies; (iii) The business cycle and the N.I.P.; (iv) Training; and (v) Information search and background studies.

The comments and recommendations are aimed at assisting in better integrating the policy guidelines and the battery of instruments at the disposal of the authorities.

i. Consensual setting of PS as a central tool to reconstitute government/industry relationships under the new policy paradigm. The new dialogue.

i.i. Past PS-related experience in Brazil

The use of PS as a quid pro quo for government support to the private sector is not new to Brazilian industrial policy makers. They have been set in the past as a requisite for acceding to government procurement, export subsidies, financial support for energy saving programmes and authorization to borrow foreign technology--through Petrobras' procurement practices, BEFIEX' programmes, the energy policy and INPI's Ato Normativo number 15.

However, this past experience has not been necessarily geared to entice enterprises to get closer to international best practice. Instead, promoting growth and import substitution in order to tap the domestic market potential and generate foreign exchange were the *primary* objectives. Opposite has been the criterion pursued in the Republic of Korea, Taiwan, Thailand and Malaysia--as well as in most OECD countries. Herein lies one of the keys to the successful industrial performance of these countries.

Not only the setting of P.S. in Brazil has not in the past been mainly geared to improve standards of competitiveness; in addition, the different instruments used (subsidies, financial assistance, legal sanctions) were not finely tuned towards convergent objectives. However, although the criteria applied are no longer useful, the instruments and related experience can play a key role under the new principles governing the N.I.P.

i.ii. Technical and Economic PS under the new policy paradigm

P.S should be both, economic and technical in orientation. An example of an economic P.S. would be setting a target of a specified level of output, export, investment, or training within a stated time period. An example of an technical P.S. would be setting a target of a specified quality level, yield, or level of sophistication of training. The expected impact of economic and technical P.S. should be made explicit.

The powerful instrument of PS has to be re-assessed in the light of the need to reconstitute government/industry relationships under the new policy paradigm. To achieve this, they must be :

(i) based on shared and transparent information, consensus and strict reciprocity rather than on coercion and/or loose monitoring;

(ii) integrated and comprehensive both in objectives and means rather than scattered and unrelated in both respects; and

(iii) adaptable over time to increasingly upgraded targets rather than static and once-for-all and ever.

These requisites entail, among other things, an active participation of the private sector in the setting up and monitoring of the standards to be agreed upon. Such agreement is the only way to gain the full commitment of the private sector and thereby insure the achievement of the P.S. A learning process in this new type of government/industry collaboration has to be allowed for. Mutual trust must be built and working relationships developed.

These are some of the main challenges ahead. Overcoming them may take some time. For this, the setting up and effective implementation of consensus-building mechanisms (as actually provided for in the P.C.I. through the CEP and the GEPS) will play an important role. Beyond the difficulties of implementation, a vital condition is the existence of a agreement between government and industry as to the need to create this new dialogue.

The public sector needs to strengthen its technical dialogue capacity by resorting more effectively to its human resources scattered across a range of different institutions (BNDES, INPI, IPT, etc.) and having the ability to operationalize the learned--and lengthy--studies produced by Universities and research centres so that they can serve as an actual policy-making tool. The tapping of international expertise, including the use of expatriates by allowing swift access to industrial and technological intelligence through the establishment of agile and flexible of information networks is another core input required.

The use of PS may or may not facilitate convergency with international best practice. However, to be consistent with the N.I.P., such convergency must be ensured by focusing on gains in competitiveness as the way to achieve higher growth rates (indispensable for the Brazilian economy if it is to absorb the over 1.5 million people that enter the labour market every year), rather than the opposite.

The ability to identify and assess how a standard agreed upon, such as a given rate of increase in R&D expenditures, is to influence competitive performance, is a sine-qua-non for the successful implementation of PS. Thus, for instance, there is no need to achieve high export rates for every industry but every industry should be exposed to international competition even if by exporting a tiny percentage of its output. PS may help to diffuse best practices among the bulk of the enterprises. In the area of concessional credit, PS allow the establishment of a link between capacity expansion (gains in output or "growth") and creation of technological capability (gains in innovative ability or "competitiveness").

P.S. should be also part of regional industrial policy. To the extent that the regional dimension is not integrated into the overall industrial policy its effectiveness will be considerably weakened.

i.iii. Summary and Recommendations

To sum up:

i. As a general rule, no support should be given to the private sector without the stipulation of concrete, unambiguous performance standards--PS from now on;

ii. PS should be set so as to converge with best international practice and in such a way that they are achievable yet a challenge. They should result from a process of negotiation and consensus-building between the parties involved: ie., the enterprise and/or industry association; the government organization responsible for providing business with the support in exchange for which the PS are agreed upon; the government body responsible for monitoring the PS and labour. There should be a careful monitoring of the conditions under which said standards, if not attained, should be re-negotiated. The monitoring function should be delegated as far as possible.

iii. There might be some benefits the government wishes to give enterprises under the NIP which would not have PS attached to them--eg., the reduction of taxes on purchases of capital goods. Generally, however, the mission is of the opinion that government should attach PS to all major forms of support provided to the private sector and to state-owned-enterprises. The government has the chance to familiarize both SOEs and their suppliers with PS by means of its procurement function, such as Petrobras has been doing under the previous incentive regime. PS should also be applied to the support the government provides firms in the area of technological capability development.

Based on the above, the following recommendations are put forward:

i. Within the Ministry of Economy, Finance and Planning, strengthening of the DIT by means of:

(a) creation of more stable jobs;

(b) articulation of clear career paths;

(c) award of competitive salaries; and,

(d) Improvement in general conditions, particularly those relating to technical support. Lest these reforms are introduced, the DIT will experience a high turnover and will attract low calibre professional personnel.

ii. The interface between BNDES and DIT should be strengthened in order to ensure that financial support to firms is made conditional on the introduction of PS. One way to do this would be by having BNDES personal participating in the sectoral commissions and actively assisting the DIT in applying results from industrial diagnosis surveys to policy-making. This closer co-operation would require, among other things, clearer orientations as to how the privatization programmes and the objectives of the industrial policy programmes fit with each other.

iii. To privatize optimally it is advisable to take steps towards bringing SOEs up to international levels of competitiveness as quickly as possible. This requires restructuring SOEs, subjecting them to PS, and introducing the same types of programmes to enhance technological capability, quality and productivity as in the private sector.

iv. The implementation and monitoring of PS must be accomplished by the government as simply and cheaply as possible. Towards this end, it may be worthwhile for the government not only to strengthen ties between BNDES and DIC, but also between these two entities and INMETRO, which may be instrumental in the development, implementation and monitoring of technical PS. As a vital part of the consensus-building process referred to above, the private sector should participate actively in the PS setting process.

ii. A diffusion-oriented approach as a guide for the new i&t policies

ii.i. Introduction

Starting with the first oil crisis of 1973 and, even more so, during the 1980s a clear change took place in the nature of industrial policies. It started in Japan and then gradually spread to a host of other OECD countries, including the US and to semi-industrialized countries. The change involved:

(i) a transition from an industrial policy based on protection and direct subsidization to a policy of supporting R&D and technological change more generally. Thus a distinct I&T policy emerged, as compared with the science/higher education policy and the "pure" industrial policy; and,

(ii) A change of technology policy in favour of the development of generic technological capabilities-TC at the expense of direct R&D support to business firms. The latter emphasizes the development of improved products and processes which are specific and which supposedly have a direct economic value. The former relates to pre-competitive, generic capabilities, whose value is generally indirect for it depends on the subsequent uses given to these capabilities (e.g., the provision of technological services or inputs to specific R&D projects at the firm level). This trend is more relevant to advanced industrial countries than to semi-industrial countries. In this case, R&D is still to become a *routine* activity in most of the industrial spectrum so that the transition is still under way. Here there is a case for continuing to support specific enterprise programmes while acquiring an increasingly generic focus.

ii.ii. Characteristics of the technological infrastructure-TI and related policy

TI involve capabilities that transcend the needs of any one individual firm within the relevant industry sector, thereby serving numerous uses and users. In order to perform this way, such TC are endowed with the following attributes :

(i) *a generic quality*, ie., as contrasting with highly application-specific skills; such quality may apply as much to scientific research as to development and engineering efforts insofar as externalities exist in the application and development of TC;

(ii) *critical mass effort* in order to generate positive, economic value. This is needed to provide a spectrum of qualitatively related but distinct capabilities rather than production at an efficient scale of a standards commodity (which is a major difference between a TI

and a conventional infrastructure such as electric power, water, etc.).

(iii) *multi-disciplinarity*: a necessary consequence of the fact that TC should be utilizable (directly) for producing services or as inputs to specific R&D projects;

(iv) *pre-competitiveness*: economic value is not derived directly from the new capability but indirectly through the activities that it sustains (this involves both, absence of clear markets and uncertainty); finally,

(v) need for achieving user co-operation and even networking.

ii.iii Need for co-operation and networking among users

The need for co-operation and networking among users is particularly felt relating to: (i) the setting of the technology research agenda; (ii) co-operating in information search and pre-commercial technology research project execution; and, (iii) building the market through learning about the usefulness of relying on the services of common technology capabilities.

The first two reasons are particularly relevant for cutting-edge technological capabilities, while the last reason may be even more central for conventional industry capabilities. The need for user co-operation in building infrastructure distinguishes a technological from a conventional infrastructure and this derives from the fact that the output is not known nor a standard commodity. It also explains why it may be difficult to find an entrepreneur who will invest in developing the infrastructure on commercial basis while shedding additional light on potential market failures derived from the need of user co-operation.

ii.iv. TI, Organization and Markets

Success in developing new TI depends critically on the organizational form adopted for project design, execution and for subsequent application.

The organization, for instance a laboratory, may be permanent or temporary; and it may consist of just a secretariat or of an operational facility (like the joint lab created in the VLSI project in Japan). There are, of course, differences across sectors in supply/demand interactions. Where frontier developments are faster it may be advisable to support the setting up of design (marketing, packaging) capabilities and pilot projects that may create demonstration and trigger effects by inducing the industrialists to take up the work by themselves.

For sectoral infrastructures, e.g., those catering to the diffusion of world technologies to domestic conventional industries, a key issue is the relationship between the organization housing the new capabilities and the respective industry association. Thus for instance, in Japan government policy has frequently induced such associations to take care of a significant share of the co-operative work mentioned above). In the case of functional, more advanced TI a key issue is the relationship with the Universities. It is clear that physical proximity to a campus does not necessarily mean adoption of the management approach and incentives structure that exists at the University.

The rationale of the TI is either non-existence of markets or existence of non-clear or imperfect markets. Conventional infrastructures perform a mediation function between users and suppliers because some of the products or services may be non-trading goods. TI should also perform the second function of market building. Thus, the mediation leads to learning both on the part of the local supplier of the service and on the part of the local user, who learns to define his needs in terms of the new technology. Therefore, his "demand" for the new technology increases, while other users become aware of the potential utility of using it; and person-embodied skills in successful mediation are built within the personnel of the organization housing the new capabilities (creation of supply).

However, once the market for the services is created, there is no reason for service provision to take place within the public sector. One implication of this is the need to transfer the new capabilities to the private sector. The infrastructure organization may either close down or adopt an additional capability to provide industry relevant services whose market is non-existent or unclear (privatization or partial devolution of ownership to the private sector are alternatives to explicit transfer of the capability out of the organization).

ii.v. Technology Capability Development: Supply or Demand Driven

As pointed out already, the notion of TI--or of the TC that comes with it--, should be distinguished from both that of specific product/process improvement-related applications and that of scientific research. It may, however, be related to both--for instance a capability addressed to making effective use of scientific knowledge in industry.

The approach to successful capability development cannot be dealt with along the lines of a purely supply-push approach (such as that characterizing curiosity-oriented research), or in terms of the traditional demand-pull approach (which does characterize a substantial portion of the innovation process). It is in fact an hybrid of the two: on the one hand, as no *specific* product or process is kept in mind, it is impossible to talk of pure demand-pull; on the other, capability development should not be purely curiosity-oriented but rather satisfy an industry-relevance criteria, one which cannot be based on existing demands (since the market for the activities flowing from the capabilities is not yet developed) but on general needs. The absence of markets also explains the necessity of generating alternative mechanisms of linking needs to capabilities.

ii.vi. General Implications for Brazilian I&T policies

A naive "increased demand orientation" as a "solution" of the problem of linking Brazilian S&T institutions to industry should be avoided. It may be true that both the setting up of numerous such institutions in the past and their activities have taken place without strong links with production. However, the above mentioned re-orientation may be only a small part of the story. The reason is the strong likelihood that a whole range of new industry-relevant, both sectoral and functional, technological capabilities may be required in order to respond to the present and future needs of industry.

This is even more so as a result of the budgetary constraints that faced the country during the 1980s. Thus, in addition to attempts at improving the coupling the activity of existing institutions, it is important to design and

implement new TI. The need for this is dictated by the major changes at the international technological frontier, by the process of liberalization initiated by the government and by the unmet needs of Brazilian industry. Moreover, there may be limits to the extent to which increased demand orientation may benefit the economy. Real new possibilities of answering specific demands may depend on new capabilities many of which will depend on new investments.

(ii) Development of "new capabilities" does not necessarily mean focusing on very ambitious cutting-edge technologies in order to provide the technological basis for revolutionary new products and processes. Rather, it could be oriented to enabling local industry to effectively utilize the new technologies. Thus a programme in Microelectronics could focus on enabling SMSE in both conventional and sophisticated industries to use Application Specific Semiconductor Devices (ASIC) rather than to develop design and production capabilities for the "chips" themselves (see Appendix on the Stuttgart Institute). The later policy has been followed by large countries like Japan, but the possibilities of success for Brazil in this line are much more limited.

The adoption of a diffusion-oriented policy paradigm should not preclude the selection of a narrow range of high-tech developments. "Stand-by" capabilities in advanced fields should definitely be developed so as to keep the options open in view of new developments. But a "bread and butter" approach, which will provide the resources and targets for more ambitious projects (while enabling output and employment to grow steadily) should not be neglected.

Dissatisfaction with some of the large mission-oriented technological development programmes (informatics, ethanol, etc.) should not entail abandoning collective-co-operative capabilities development altogether (which is in fact one of the major benefits drew from those programmes). Rather, it should entail a re-orientation of those efforts so as to readdress the balance in favour of diffusion rather than of a broad range of cutting-edge technological developments that lack follow-up development capabilities in industry. But there still remains, and increasingly so, an enormous need for technological development at the branch and functional level, which goes beyond (and sustains/complements) the specific organization of technological effort within individual firms.

There is plenty of room within the ICP and PBQP programmes to strengthen non-firm specific technological capabilities along the lines just discussed. There is in fact in the ICP a bias towards firm-based instruments of support and promotion-a typical example being cheap credits for promoting automation. However, efficient diffusion of new production technology may require sector level activity, e.g., in the developing of new capabilities, such as setting up a demonstration project of the new equipment; training; software development to adapt the equipment to local conditions; generating a pool of consultants in the new technology in order to transfer at a later stage the performance of the various advisory services to market forces, etc. The numerous organizations dealing with this issue within the Italian traditional industry provide a good illustration (see Appendix).

Sector level diffusion oriented policies in Europe:

(i) are oriented to SMSE also in traditional sectors which involves a shift from past emphasis on large (national champion) firms--like used to be the case also in Brazil;

(ii) involve a sectoral level component of the overall policy, and not only a firm-oriented component; and,

(iii) are initiated and orchestrated locally and regionally in a decentralized fashion e.g., by industry associations.

The government has an important catalytic role in triggering a process of endogenous capability development at the sectoral level.

Moreover, such capability development should also serve the purpose of other targets of Brazilian sectoral policy, such as vertical disintegration, joint ventures and integration of Brazilian firms into world industry. Very careful case studies of such capability needs are required in order to preserve national assets (including human capital and intangibles) while assuring the competitiveness of Brazilian enterprises.

The PBQP is largely firm-oriented and, although the participation of existing networks of government laboratories (norms, metrology, analysis, standards, testing, etc.) is called for, the perspective resembles that of a "general infrastructure" rather than the more specific TI notion laid down above. The introduction of new quality control and productivity upgrading innovations and procedures necessitates, over and above specific actions at the level of the enterprise and regarding the general S&T infrastructure, a sectorally (and functionally) oriented effort at developing basic capabilities--prior to effective diffusion to firms. This relates to the connection of the PBQP and ICP programmes.

ii.vii. Proposals on TI Policy

ii.vii.i. Search for and identification of desirable technological capability programmes

The transition form an "atomistic", firm-based type of support, to a policy of emphasizing co-operative development of capabilities is no easy and there certainly is an important inducing role to be taken up by the government in triggering the new organizational forms. An important and increasing role should be played by industry associations such as FIESP and CNI. At the same time the Government should stimulate these to take an increasing share of the initiation, orchestration and support of co-operative technological capability development.

Probably a major bottleneck for initiating the process is the extreme sparsity of co-operative projects. They can only be generated by an explicit interactive effort devoted to identifying needs and areas of common interest among major actors of, e.g., a particular industrial sector. Individual firms are unlikely to initiate such an effort, except under very pressing circumstances. Hence, the search process should be initiated and financed by the Government, preferably with the co-operation of industry associations. We are aware that inertia and lack of experience along this lines involves resistance. However, if this problem is not addressed, important degrees of freedom in the IT policy will be lost.

Rather than search for "strategic" areas where capabilities could have numerous, albeit uncertain spin-offs, in a wide variety of sectors, it may be more important to prove the concept of co-operative capabilities development within the context of a simpler project or set of projects which may have reasonable probabilities of success, eg., where there is a pressing need and

prospects of achieving some kind of active participation of a number of firms (such as in pollution problems from leather tanning in the Sao Paulo state).

These initial projects would be an essential input to a more definitive formulation of the policy in this area--they comprise the so-called experimental stage of the policy, one where it is misleading to separate formulation of polity from its actual implementation. At a further state, an effort should also be made to identify more critical areas for co-operative technological development.

The initial, *experimental stage* should then involve:

(i) search for a simple case, e.g., a routine type of capability where co-operative development would satisfy a pressing problem facing the private sector. Search here involves: diagnoses of current problems facing the sector; identification of needs for generic technological capabilities requiring co-operative development; setting a research/technological development agenda involving the consensus of a group of firms and preferably the active involvement of the industry association concerned;

(ii) government agencies should stimulate this search for example by declaring their willingness to finance the required background studies proposed by any industry association or consortia of firms who has declared an interest. It would also be important for government officials involved in the corresponding sector to actively participate or be involved in the execution of the search. In parallel to this, and even more so if no industry association or group of firms is interested, government agencies such as BNDES may initiate such search. In all cases, information from existing studies should be utilized and a wide pattern of interaction among different research groups at universities and research institutes should be generated.

Underlying the above there is the presumption that significant external economies may be generated by initial co-operative technological development projects. They may pave the way for an increasing flow of such projects in the future, and to increased participation of the private sector in initiation and execution. The externalities which are specific to co-operative TI development are:

(i) proof that co-operation is indeed possible--and, in the extreme case, that firms of the same sector who may also be competitors may co-operate in areas of common interest;

(ii) knowledge and experience on how to "search"-identify problems and generic needs and achieve consensus on a technological development agenda;

(iii) the adequate organizational forms and managerial approaches for developing the capabilities and for 'housing' them during their diffusion (or that of the services flowing from them) to the productive sectors.

For instance, it is clear that a hybrid supply push-demand pull approach is essential for identifying areas and defining a work agenda around a specific new capability. This also necessitates the intimate participation of industry from the early stages and not once the agenda has been established

or the work completed. Moreover, the possibilities of a *temporary organization* involving active participation of firms (e.g, who send their own personnel to the project) in project execution should be very seriously considered-especially given the desire to avoid as far as possible the emergence of new bureaucracies.

Moreover, the links with universities should be carefully assessed, as well as the most efficient ways to effect transfer of results to participants and to a wider circle of potential users. Some projects should not even be considered or started if industry is not interested or if no "network entrepreneur" is available to orchestrate the process; in other cases, it is important to begin with "search" even if industry is not yet interested, given the potential importance of the area, and in the hope that industry may become interested once the first findings on needs are made available. These observations are only intended to provide a glimpse of the complexity of formulating and executing a TI policy.

ii.vii.ii. Massive Financing of Early Projects

This follows directly from the above. It refers first and foremost to the experimental stage. Again, the purpose of massive government support of early projects is to trigger subsequent search/execution of co-operative capability development by the private sector. Thus, as the new organizational form of innovative effort takes hold in the economy, the role of government in initiation, management and finance will decline.

Industry associations and ad-hoc consortia of firms will take over the task of setting up numerous new TIs, although this process is slow and may take a decade or so to get finally implanted. Thereafter the role of government will constraint itself to certain kinds of search (e.g., in functional areas where critical mass effort is required which may also serve the needs of numerous users belonging to several sectors), and in certain more innovative or cutting-edge capabilities.

As to which projects to finance (or the measure of selectivity versus neutrality of government vis a vis co-operative TC development), the government should announce that it would be willing to finance any "good" project proposed by industry. "Good" means, among other things, resulting from a full-fledged search process and also having assurances of active industry participation. This implies that funds could be made available without creating an explicit set of financial tools.

In some sense, "neutrality" may be desirable at the beginning for "good" projects only--and once the endogenous process of market forces themselves leads to numerous good projects and to a budget constraint, then more selective approaches should be adopted. Only those projects having clearly strong externalities should be supported at this second more definitive stage, while the more routine projects should be financed by the firms themselves and/or the industry associations.

Specifically, the government should pressure industry associations to initiate search with a promise of subsequent massive support in case good projects are arrived at. This is a particularly felt need for traditional industry. Simultaneously, the government (either through the Ministry of Economy, Finance and Planning; the Secretary of Science and Technology; or the BNDES) should initiate a "search" project for a sophisticated capability such as a "user-oriented" Microelectronics Center (see Annex for an example of one such center in Germany).

This has not been the main emphasis of past Brazilian policy towards microelectronics, despite the great need for accessing ASIC technology available worldwide. A design center for chips would probably be enough, although it might have to involve some production capability and access to production facilities already existing in Brazil. The return to the national economy of such a center could be substantial.

The effective diffusion of microelectronics necessitates a "mediator" between world supply of components (we focus here on ASICs) and local needs, particularly of conventional industry. Therefore a main component of capability creation in informatics should be user-oriented. This means a design center of sorts which may also involve some limited production capability. It is surprising that past policies have emphasized microelectronic technology as a basic for a Brazilian sector *at the expense of a capability for effectively making use* of world technology. This proposal aims at correcting this imbalance which has also impacted negatively on the competitiveness of the whole of the capital goods sector.

ii.vii.iii. An Industrial R&D Fund

This is an indispensable ingredient for an entrepreneurially oriented informatics sector in Brazil., given the imperfections in its capital market and the sparsity of venture capital sources. Numerous product development opportunities exist both for the local market and for exports, particularly via the utilization of ready made components available in the world market. There is also a lot of electronics technology that is person-embodied (ie., in engineers) and applicable to small and divisible projects. The intended effect would be one of "swarming" of numerous new entrepreneurs trying their luck in R&D in what should be a "collective" effort at generating "innovation capabilities". Through a process of natural selection, some of these firms will grow and begin to contribute substantially to wealth creation in Brazil.

The Industrial R&D Fund should be created by FINEP or BNDES. It could be managed according to the following principles:

(i) *Universality and neutrality*: Any good R&D project submitted will be supported, whatever the sector from which it comes from, the product class or technological area involved. The Fund will support the R&D function generally and not any particular economic sector or branch of industry;

(ii) *Grant Support*: it is proposed that the government should defray 50 per cent of the R&D costs of the project and the private entrepreneur the remainder. This will assure that bonafide projects are submitted and that the entrepreneur will be active in launching a commercially profitable product. Grants are critical in order to share risks and to provide finance, both essential problems in Brazil. No real guarantees are involved since no loan is involved;

(iii) *Role of Government*: is to administer its support and not to perform a full cost-benefit analysis of submitted projects. This because the entrepreneur pays 50% of costs and he will thus only submit projects with reasonable profit prospects. In a more dynamic sense, however, the Fund could provide information to entrepreneurs, especially new ones. It will also accumulate a lot of experience and may advise them how to go about preparing a Business Plan and how to link marketing and production to R&D.

(v) *Terms*: Yearly renewal of project support dependent on achieving agreed upon PS.

The Fund would be an essential component of any programme for the Informatics sector. It would not cost much. US$ 5 million per year would suffice as a starting point over the first years.

iii. The Business Cycle and the N.I.P.

One of the main industrial policy problems faced by the western economies is the shrinkage of training and R&D efforts during downswings. It in this way that the bases for increased competitiveness during the following upswings are eroded. This is exactly one of the problems facing Brazilian industry. The authorities are aware of this as are the most enlightened industrialists. However, there are systemic reasons why not much of substance appears to be done in this respect. Here the government shares a heavy responsibility in inducing and facilitating enterprises to lengthen their time horizons by shifting their time/cost tradeoff ratios.

Brazilian industry is going through a period of deep recession. Many investment decisions are held back. And this particularly affects the allocation of resources to technological development and human resource formation. Steps ought to be taken urgently to facilitate firms taking advantage of the resulting slack in order to build up the skills and capabilities that will be needed during the next upswing.

Some of these steps concern training.

iv. Training

It is recommended that crash training programmes of key R&D and production personnel to be sent abroad for periods ranging between 1 to 3 months. The government should negotiate for as much foreign assistance as possible (say in conjunction with the repayment of its debt) to defray the costs of overseas training in foreign facilities of R&D managers, process engineers and first line supervisors to get "hands on" experience with state-of-the-art production in overseas firms. The industries in which foreign governments may agree to undertake training may not be in frontier areas, but might be in sectors with good world market prospects for Brazil; and,

There is an urgent need in Brazil for the introduction of programmes to help firms begin and treat their workforce as an asset, rather than as an unlimited and unvaluable free good. SENAI's services should be upgraded both in their capacity to attend to custom-made needs of the firms and in their flexibility of response and facilitator of fertilization across technical disciplines.

v. Information Search and Background Studies

Information search and background studies are recommended in the following six critical areas in order to tackle actual and/or potential bottlenecks in the implementation of the industrial policy.

i. (a) The setting, negotiating, timing of introduction and monitoring of performance standards as a tool of industrial policy. (b) Sectoral and regional specificities. (c) Methodological, information, and technical requirements. (d) Critical evaluation of

the international and Brazilian experiences (BEFIEX, PETROBRAS, energy programmes, Ato Normativo Number 15). (e) Necessary synergies among industrial policy instruments. (f) Evaluation of technical assistance needs to help enterprises define their PS frontier and of the expected impact of economic and technical PS on gains in competitiveness. And, (g) Possible pilot, demonstration case. This activity could follow a request by Brazilian industry (which should be main actor in this approach). It may be eligible for financing under the World Bank Public Sector Management Programme. It should be an exercise in line with the new government/industry interaction.

ii. Assessment of industrial restructuring response times at the sectoral level, the corresponding trade liberalization schedules adopted and industrial policy focuses thereof;

iii. Operationalization of sectoral diagnosis studies for purposes of industrial policy making. Development of appropriate indicators;

iv. Identification of relevant generic technologies that cut across industry to be developed through co-operative efforts: institutional mechanisms, incentives, skill and financial requirements;

v. The design and application of I&T restructuring policy instruments at times of recession;

vi. The relevant international experience in industrial apprenticeship and training strategies.

In addition, relating to MERCOSUR, a multi-country study should be undertaken on prospective patterns of specialization within the sub-region in selected industrial sectors such as capital goods, automobiles, consumer durables, agro-industry and chemicals and related policies.

Annex 1

Korea Industrial Development Revisited

Towards the end of 1991 it was submitted in a World Bank document that the Bank's previous interpretation of Korea's experience with industrialization had not correctly conveyed how events actually happened.[1] These in three main ways.

First, it would have unwarranted used the experience related to the heavy and chemical industries policy as an argument against the strategy of selective intervention. However, this programme included a constant transfer of activities from import substitution to export-orientation and, by the 1980s, over half of manufactured exports were originating in heavy industry.

Second, the micro-level process of capability acquisition which underpins industrial success was underplayed and overlooked. Only the need for disciplined, educated and trainable labour, and for incentives provided by export-orientation, were pointed out. The entire area in between, of capability development, technological search and effort, interaction with other firms and institutions, was left almost wholly blank.

Third, the Banks analytical approach has been at odds with its project work. In contrast with the former, the latter does appreciate capability building, selectivity, and institutions. While the general policy analysis emphasized the undesirability of government interventions, work at the project level was more "structuralist" and favourable to intervention.

It is acknowledged now that the great success of the Korean strategy may have muted Bank concern about the extensiveness of interventions. Until the late 1970s the Bank fully endorsed the Korean Government's view that it was essential to move into heavy industry, initially behind protective barriers, to diversify its areas of comparative advantage. The broad strategy of rapid industrial deepening was thought both necessary and desirable. Although some caution was expressed about specific targets and skill and institutional requirements, the Bank had no hesitation in that the government should, in principle, play the lead role in industrial development. The Bank also stressed through the 1970s the need for Korea to build up its machinery sector, which it regarded as strategic to the country's long-term industrial success and favoured selective interventions.

Now the view the Bank acquired during the second half of the 1980s. According to that view, functional interventions in factor markets might be justified but activities that promoted selected interventions were suspicious. Such interventions were confined to product the capital markets (i.e. to variable rates of effective protection and credit allocation to selected activities). A strong case was presented for low, uniform rates of protection to infant industries and market price determined investment allocation. It was considered that the costs of the heavy and chemical industries programme were too high, but it did not clearly distinguish between the costs that arose from the exercise of selective interventions in principle from those that arose from overhasty execution and exogenous shocks (only the first set of

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[1] This issue is stillbeing discussed within the World Bank and does not constitute its official position.

costs could be an argument against the strategy of selective interventions). In sum, selective interventions were seen as essentially inefficient and Korean experience supported the view that only functional (neutral interventions were desirable.

The Bank document acknowledges that neither theory nor the evidence from Korea support such a conclusion. The process of capability acquisition at the firm level was not properly understood. The risk, uncertainty and duration of the learning process in developing countries was not given proper consideration. The significance of externalities, especially technological externalities, was minimized. Intervention in a firm's external support system was generally termed functional, when some of it may have been highly selective. In fact the distinction between selective and functional interventions was spurious because most factor market interventions (generic or activity-specific) were geared to the strategy of industrial deepening and national ownership pursued by the Government. The creation of many high level skills and technological and other institutions, and the support of technology imports or export growth were specifically directed at the activities being selectively promoted.

It is admitted that the evidence from Korea does not support the conclusion that selective interventions were inefficient per se. In addition, the Bank failed, to examine the process of gaining competitiveness at the firm level. Despite its constant propounding of the Korean model, Bank reports have had little or nothing to say on how Korean firms actually gained competitiveness. The Bank refused to learn lessons from projects it sponsored like in heavy engineering or where it had given wrong policy advice, like in automobiles. There appears to be no mechanism by which the Bank could absorb such lessons for future work on industry in similar subsectors in other countries. The framework that the Bank imposed on itself may have served to exclude useful information. The needs of capability development were not integrated into the general approach to industrial strategy.

The areas of human capital development and technological effort were compartmentalized in such a way that industrialization strategy was not directly linked to educational or technological strategy. The analysis of technological policies, institutions or firm-level determinants as an inherent part of industrial strategy has been rarely systematically dealt with by the Bank. Imperfections in international technology markets were usually not acknowledged, and the need to intervene to support technology imports or technology absorption -- as practised actively in Korea -- was generally dismissed. The Korean strategy of deliberately excluding foreign-controlled direct investments to build up indigenous capabilities was totally ignored in Bank reports because it conflicted with the Bank's stated objective of maximizing international private capital flows.

Now it is acknowledged that: (i) Korean efforts to develop indigenous plant engineering capabilities by intervening in technology contracts with foreign contractors have led to an impressive build-up of skills in this area. The implications of promoting such design and project capabilities for protecting indigenous learning would be of interest to many developing countries, but were not addressed; (ii) the massive increase in the volume of private sector R&D in recent years has taken Korea far ahead of other NICs, and even some OECD countries, in technological effort. While traceable largely to its heavy industry strategy, its creation of the *chaebol* and its export-orientation, there may have been other policy factors responsible about which little is known; (iii) an extensive S&T infrastructure was developed to support firm level efforts. The nature of the linkages between them was left

unclear, as was the explanation of the effectiveness of Korean institutions relative to counterparts in other developing countries. Yet these issues plague technology policies in many industrializing countries, and some insights from Korea would have been valuable; (iv) despite frequent acknowledgement of market failures in technology markets, the precise source of those failures and relevant remedies were not explored. The need for selectivity in exercising technological interventions was not acknowledged, though the Korean Government does exercise extreme selectivity in targeting such interventions (and the Bank has financed one such intervention, in electronics).

In sum, it is acknowledged that the Korean Government played a central and pervasive role in guiding and stimulating the industrial development process right from the start, substituting for the lack of long-term entrepreneurial view with export guidance and encouraging the formation of large, integrated economic agents whom it could deal efficiently. Selective interventions were resorted to directed primarily at areas of Korea's future comparative advantage.

The Bank's apparent split between its broad policy analysis, which eschewed selectivity and propagated a broadly incentives-based policy approach, and its micro-level practice, which supported selectivity, mirrores the split between trade strategy explanations of industrial success and those based on capability acquisition in the development literature.

Annex 2

COMPETITION POLICY IN THE EUROPEAN COMMUNITY
The EC criteria for legitimizing subsidies to industry

The Commission of the European Communities is very active in the field of industrial policy. This is reflected in their Annual Reports on Competition Policy. The following are selected excerpts from the Nineteenth Report on Competition Policy of the Commission of the European Communities, Luxembourg, 1990.

I. EC Studies relating to government support for enterprises

i. The effect of State aids on intra-Community competition. The example of the automobile sector

A number of Member States awarded huge sums of aid during the crisis years in the 1970s and in the following period of restructuring. The industry is now faced with the increased production capacity of Japanese manufacturers and their growing penetration of the upper segment of the market.

There is some justification for the award of subsidies to the motor vehicle industry, notably the positive external effects of investment in less-favoured regions, the high risk attached to certain investments and the maintenance of competition by preventing the disappearance of certain manufacturers.

On the other hand, this aid has caused extensive distortions and could have contributed to the misallocation of resources owing to the absence of motivation they can cause. The theoretical analysis reveals cases where aid is liable to alter the relative market shares of manufacturers and diminish general well-being, even more acutely if other Member States also step up their own contributions.

It is precisely with the aim of avoiding such escalation that the Commission adopted a framework for State aid to the sector aimed at increasing transparency and subjecting the award of aid to more stringent tests.

ii. Assessment of catchment areas

Several Member States have created "employment areas" in order to provide fresh opportunities in areas of high unemployment and to make regions experiencing extensive restructuring problems more attractive. There are, however, substantial differences in the aid schemes and in the impact of the schemes.

In Belgium and France, the main benefit is a 10-year exemption from corporation tax; the efficacy of this incentives thus depends on the ability of the newly established enterprises to achieve profitability in the first years of operation. In the UK, the effect of the advantages is more complex, the consequences of exemption from property tax being reflected in land prices in the employment areas.

The impact of the employment areas varies considerably from country to country. In Belgium, they have led to the creation of only a few jobs and firms, chiefly because many other aid schemes are in existence. In France, the system is still developing but a rapid rise in the number of jobs is expected in the areas where the programme is under way. The employment areas have had

the greatest success in the UK: according to official reports, the programme has resulted in some 35.000 new jobs. New enterprises are generally small and aimed at local and regional markets, which tends to limit the impact of the aid policy on intra-Community trade.

iii. Repercussions of subsidies for export to non-member countries, on intra-Community competition

International constraints and especially the consensus between the OECD countries leave considerable room for manoeuvre as regards the award of export subsidies. Member States have used these as one of several means of maintaining or increasing their market shares. Subsidies for intra-Community exports are generally prohibited. Subsidies can be granted, either in the form of loans on more favourable terms than those of the market, or through public export insurance systems where the premiums paid do not cover losses and operating costs. Elements of aid for firms may also be included in development aid and in loans to developing countries where they are tied to purchases to be made in the awarding country.

Subsidies included in the insurance schemes have recently developed more rapidly than subsidies tied to export credits. Sectorally, subsidies are distributed very unevenly in some countries and represent over 10 per cent of the value of exports to non-OECD countries. The industries most affected were mechanical engineering, metals, electrical equipment, means of transport and construction. Some data also show that subsidies are specifically directed towards exports to certain countries. These data point to the conclusion that export subsidies can increase export market shares of some Member States at the expense of others and can therefore affect competition in the common market. The effect is even greater in cases where the cost difference between exporting firms is small, demand is elastic, competition in the sector is intensive, product differentiation if low and economies of scale considerable.

II. State Aids for R&D

The Commission pursued the policy it had started in 1986 to enhance transparency in accordance with the Community framework on State aids for R&D.

In 1989, the total value of notified aid schemes was ECU 790 million. Specific awards under the Eureka initiative, approved by the Commission in the same period, represented a total of ECU 300 million in aid. Total budgets of R&D aid schemes in force in 1989, including those previously approved by the Commission, totalled ECU 4550 million.

In all cases dealt with by the Commission, approval was subject to a twofold obligation: to notify individual awards of aid under existing schemes to projects costing more than ECU 20 million, and to send annual reports on the application of schemes. A project costing in excess of ECU 20 million is regarded as inherently liable to distort competition, which could affect trade between Member States. The question of size is such that the projects in question must be assessed on their own merits and not solely on the basis of the scheme providing the assistance.

The Commission has also started to review the problem of R&D contracts. This will constitute one of the main features of action taken in respect of R&D aid in the next few years in view of the far-reaching implications for competition resulting from extensive recourse to major contracts. This matter must also be examined from the standpoint of the EC's relations with its leading trading partners, especially within the GATT.

One of the main areas in which the Commission is concerned with aid for R&D is the Eureka project. Four years after its launch, nearly 300 projects are underway, involving international cooperation in advanced technology, the projects represent a total estimated value of ECU 6500 million, part of which is funded with public resources.

In 1989, two thirds of the decisions adopted by the Commission on R&D aid concerned Eureka projects: the Commission approved 29 cases of aid for individual projects and took position on six schemes used to finance Eureka. Some of these schemes are specific to Eureka, as in the UK and Italy, where 10 per cent of the Applied Research Fund is set aside for Eureka under special arrangements. Other schemes are aimed more generally at the financing of international projects, such as the Dutch BTIP (Bedrijfsgerichte Technologiestimulering van Internationale Projected). The Commission approved the refinancing of and certain amendments to this scheme, whose budget is allocated almost entirely to Eureka.

In Germany and France, the choice of appropriate scheme is based on the sector concerned, the type of participant or the stage of the project Thus the German "Verkehrsforschung" scheme (transport research), against part of which the Commission opened the Article 93(2) procedure, includes a sub-programme for road transport which the Commission approved and which was used to finance German participants in the Prometheus project. The French schemes Anvar and FRT can also be used to finance participation in Eureka, the first in the case of SMEs, the second generally during the initial phases of projects.

III. Actions against restrictive business practices

The Commission fined 14 undertakings for concerned practices between the main welded steel mesh producers in the six original member States designed to fix prices or delivery quotas and to share markets. Similar practices were punished in the case of sugar refineries, perlite and furs.

IV. Examples of Cases of Aid to industries with specific structural problems

The Commission approved state aid to the coal industry in Spain, Belgium, France and the UK provided it was sufficiently digressive and accompanied by restructuring, rationalization and modernization plans. Compensatory payments were approved for Germany and Spain. The provisional volume of aid to current coal production on which the Commission adopted decisions in 1989 reached ECU 845.6 million. Aid to defray social expenditure in the coal industry totalled ECU 7.1 million. Coverage of inherited liabilities was approved for ECU 1.2 million.

The Commission obtained the withdrawal of the aid proposed by the German government to the Armenius-Werft shipyard for the building of six to eight coasters for the German shipowner Peter D_hle and adopted a negative decision in respect of German aid totalling DM 1734 million awarded for the construction of a 1700 tonne wine tanker for the German shipowner Paul H_se, an order for which German and Dutch yards were competing. Germany also withdrew an aid proposal for the building of four fishing vessels by Sietas Werft for a Chilean company. Similar cases took place with regard to Italy, Greece and Spain.

The Commission objected a subsidized loan of LIT 6 billion granted by the regional authorities of the province of Bolzano to the Bolzano steelworks but it approved the postponement of certain dates stipulated for the closure

of a number of steel plants in Italy (liquid phase at Bagnoli, cold-rolling mill at Turin, merchant bar mill at Sesto San Giovanni and steel shop at Lovere). Because of having been awarded solely for investment in areas covered by the EEC Treaty and for R&D expenditure in areas covered by both the EEC and the ECSC Treaty, the Commission approved a 3.5 per cent interest loan of PTA ECU 41 million to finance an investment in R&D programme coating to the steel manufacturer Patricio Echeverria S.A. Likewise, it approved aid to Altos Hornos de Vizcaya in the forms of grants to defray expenditure on environmental protection. The Commission also approved a non-repayable loan of ECU 528.000 to Fabrica de A_os Tom_ Feteira to support a capacity increasing investment programme granted by the Portuguese government.

The Commission took a negative decision requiring the public aluminium producers Aluminia and Comsal of Italy to repay the aid awarded illegally by the Italian government (in the form an interest-free loan to be converted into equity capital, for ECU 46.1 million).

A negative was also taken in respect of a proposal to grant aid amounting to ECU 0.76 million to Caulliez Freres, a manufacturer of combed cotton at Prouvy (northern France). The aid was to enable the firm to increase its capacity by some 70 per cent in a sector suffering from structural overcapacity, falling demand, a fall in prices and severe competition both in and outside the Community.

Approval was granted to a series of aids proposed by the German Government for a new subsidiary of Messerschmidt-B_lkow-Blohm (MBB), the German Airbus consortium, for being the first private firm participating in Deutsche Airbus and intended to promote the restructuring of the German civil aviation industry. The Commission considered that the proposed measure would strengthen the overall competitiveness of the sector and thus serve the general interest. Aid to_Short Brothers plc Belfast for ECU 527 million to enable the company to remain viable during was also authorized.

Aid for ECU 268 million to the public chemicals undertaking Quimigal (Quimica de Portugal) to reduce debts resulting from unprofitable investment which led to the closure of some plants and the rationalization of others was not approved. Instead, the Commission approved French government's aid in the form of a debt and loan write-off for ECU 681 million and two capital injections for ECU 448 million to assist Orkem (formerly CDF-Chimie) in major capacity cuts affecting fertilizers and petrochemical products.

The Commission objected permission granted by the Belgium government to make selective price increases through programme agreements concluded between the government and certain Belgian pharmaceutical companies. Price increases are allowed under the existing pricing system in exchange for certain undertakings given by the beneficiary, without the medicaments concerned losing entitlement to reimbursement under the sickness insurance scheme. The companies concluding a contract had to give an undertaking concerning investments and research projects, job creation and/or an increase in exports.

Rescue aids by the Spanish government and the governments of the autonomous regions of Andalucia, Cantabria and the Basque country for a total ECU 39 million to Megafesa, a stainless steel household goods and small electric appliances producer were objected by the Commission, which requested repayment of the aid element implicit in the subventions.

The Commission also reached a negative decision on aid granted to Brisard Machine-Outil and Berthiez Productics for ECU 3.6 and 2.5 million, respectively, with highly preferential repayment conditions to facilitate the

purchase of the French machine tool manufacturer MFL (Machines Françaises Lourdes), following its bankruptcy. This decision was made taking into account the strong competition prevailing among Community producers and the fact that the aid was not linked to a restructuring of the companies.

Similar decision was reached regarding ECU 22.4 million in aid for newsprint manufacturers in Italy aimed at allowing the newsprint industry to purchase increasing quantities of domestic newsprint at artificially high prices.

The Court of Justice passed a verdict of unlawful aid granted by the government of Germany to an aluminium producer.

V. Competition policy and government assistance to enterprises

According to a Report on EC's Scientific Research by the Court of Auditors, Luxembourg, 1991, the promotion of exploitation of R&D outputs is at the crossroads between industry and research and cannot be the exclusive domain of either. This blurred area leaves a lot of leeway for policy discretion.

VI. Special support to small and medium-sized enterprises (SMEs)

In the field of State aids, a number of programmes designed specifically to help SMEs, or of particular benefit to them, were approved by the Commission. Included among these were:

(i) a Spanish government offering one-off grants for small companies in the autonomous region of Castilla-La Mancha to invest in new plant and equipment or to extend or modernize existing plant and equipment;

(ii) a scheme of assistance introduced by the autonomous region of Madrid which is designed to help finance technological and innovative research as well as the acquisition of scientific infrastructures, and which is only available to firms with fewer than 100 staff and with a turnover of less than ECU 10 millions;

(iii) the financing by the Italian authorities of feasibility studies by small firms connected with international projects, including those arising from the Eureka programme;

(iv) a French aid scheme enabling small businesses to call in outside consultants, subject to limits which vary according to the region;

(v) a French government proposal to establish a fund for the purpose of supporting individual investment projects and joint operations in favour of SMEs, particularly in areas which have undergone major industrial restructuring;

(vi) and aid scheme in the *Land* of Hamburg, providing assistance towards the cost of consultancy services in order to facilitate the transfer of know-how, for industrial and commercial enterprises whose annual turnover does not exceed DM 15 million (ECU 7.2 million) and which are not controlled, through a majority shareholding, by another company;

(vii) the extension of a Belgian scheme providing tax relief for new companies in the high-technology sector, which employ no more than 200 people and which establish themselves in regions experiencing serious economic problems.

VII. Merger Control

On 21 December 1989, the Council adopted the Commission's proposal on the control of concentrations between undertakings. The regulation will form a cornerstone of competition policy and make a major contribution to ensuring success in the completion of the internal market.

Merger control is considered necessary for both economic and political reasons. The process of restructuring European industry has given rise and will continue to give rise to a wave of mergers. Although many such mergers have not posed any problems from the competition point of view, it must be ensured that they do not in the long run jeopardize the competition process, which lies at the heart of the common market and is essential in securing all the benefits linked with the single market.

In its scope, the new regulation covers mergers having a Community dimension, which are defined on the basis of three criteria, namely:

(i) a threshold of at least ECU 5000 million for the aggregate world-wide turnover of all the undertakings concerned.

(ii) a threshold of at least ECU 250 million for the aggregate Community wide turnover of each of at least two of the undertakings concerned.

(iii) a transnationality criterion. Community control does not apply if each of the undertakings concerned achieves two thirds of its turnover within one and the same Member State. This criterion allows mergers whose impact is mainly national to be excluded from the Community control system.

The Commission's declared intention is that thresholds will be revised downwards: the objective is to lower the overall threshold to ECU 2000 million and to reduce the Community threshold similarly.

All mergers falling within the scope of the Regulation will be assessed on the basis of clearly defined criteria. The basic concept is that of "dominant position". The creation or strengthening of a dominant position will be declared incompatible with the common market if effective competition is impeded to a significant extent, whether within the common market as a whole, or in a substantial part thereof; conversely, a merger which does not impede effective competition will be declared compatible with the common market. The assessment process will take into account the structure of the markets concerned, actual and potential competition (from inside and outside the Community), the market position of the undertakings concerned, the scope for choice on the part of third parties, barriers to entry, the interests of consumers, and technical and economic progress.

A "concentration" is defined as the acquisition of control and covers both mergers and acquisitions. This includes partial mergers and merger-type joint-ventures, but it does not cover the coordination of the behaviour of undertakings which remain independent.

The principle of mandatory prior notification by the undertakings will be applied. This has a suspensory effect on the concentration for a period of three weeks. The validity of stock exchange transactions will not be affected. The Commission has one month following notification within which to initiate proceedings. The Commission's powers of investigation and the fines provided for in the Regulation are similar to those applicable to restrictive practices. The Commission may require undertakings or assets unlawfully merged to be separated.

The regulation entered into force on 21 September 1990. The most important--and conflictive--judgement so far concerned the attempted Franco-Italian takeover of the Canadian aircraft-maker de Havilland by a Franco-Italian. The European Commission vetoed it in what Mr. Michel Rocard, the former French prime minister called a "crime against Europe". The French government and Aerospatiale, the state aerospace group are demanding the Commission to reexamine the decision on the grounds that the fostering of the European aircraft industry is more important than curbing cartels. In fact, the merger would weaken the position of other European competitors in the market for regional aircrafts.

Annex 3

US POLICIES TOWARDS GENERIC TECHNOLOGIES

The Federal Government is planning an increasingly key role in the field of "generic" and "precompetitive" technologies. The passage of the National Cooperative Research Act in 1984 paved the way by eliminating treble-damage penalty and thus largely reducing firms' fear of antitrust violations in joint R&D. DOD's expanding role in non-defence technology is also in this line.

Generic technology means a concept, component or process, or the further investigation of scientific phenomena, that has the potential to be applied to a broad range of products or processes. Precompetitive technology covers R&D activities up to the stage where technical uncertainties are sufficiently identified to permit assessment of commercial potential and prior to development of application-specific prototypes. Investment in generic and precompetitive technology is aimed at diffusion as one of its main missions. This strategy may therefore be categorized into the framework of "diffusion-oriented" policy.

Through active support of generic and precompetitive technology, the US Government will in effect expand its role beyond its traditionally "legitimate" domain -- science, and academic engineering -- and cover more "downstream" R&D activities. The new criteria for government involvement now rest on the distinctions between non-proprietary R&D with the nature of public good and proprietary R&D aimed at specific applications, rather than on the distinctions between science and technology. The attention is thus shifted from the properties of R&D activities to the usage of R&D results. Policy formulation could therefore become closely links to the needs of industry.

This strategic perspective also accommodates the "spin-off" dilemma. As "dual use" technology tends to be at the generic stage and many modern critical technologies utilized for military applications have their origin in the civilian sector (such as microelectronics), the government will be able to support the development technology which can benefit both military and civilian industries. The US military has shown deep concern over its dependence upon Japanese semi-conductors. This is the main reason for DOD to endorse SEMATECH.

Presently, among others, a broad field of manufacturing technology has been identified as needing government crucial support (see Annex 5). This is a response to a widely perceived structural shortcoming in US competitiveness. That is, in manufacturing productivity, process innovation, concurrent engineering (i.e. simultaneous design of products and production processes), etc. there is ample evidence that the US has been surpassed by Japan in many industries. Prompted provisions of the Omnibus Trade Act of 1988, DOC's NBS has been "upgraded" into the National Institute of Standards and Technology (NIST). NIST now has broadened power to do technology extension and to assist industry in developing and commercializing technology. Under NIST's direction, the Advanced Technology Program (ATP) has been proposed. ATP, authorized by Congress to receive up to $100 million per year, will give limited financial assistance -- in the form of start-up funding or a minority share of costs -- to industry-led joint R&D ventures in economically critical areas of technology. So far five areas have been spelled out: imaging electronics, advanced manufacturing applications of high-temperature superconducting materials, advanced ceramic and composite materials and semi-conductor production equipment for X-ray lithography. All these initiative are on the track guided by the new strategic thinking.

Annex 4

"Critical Technologies" in the US

Towards the end of April 1991 the White House released a report listing 22 technologies deemed critical to the U.S.'s future.

The technologies, culled from dozens of candidates, range from high-performance ceramics to technologies that lead to ecological restoration. It is the first time in recent memory that any Administration has offered specific sets of technologies around which to build policies.

The report was prepared by a 13-member National Critical Technologies Panel composed by government and private-sector members. Its chairman was chemist William D. Phillips, an associate director of the White House Office of Science and Technology Policy. The panel was formed by OSTP under a Congressional mandate sponsored by Sen. Jeff Bingaman (D.-N.M.) and will produce five more biennial reports through the year 2000.

The report describes each of the technologies (such as superconductors, ultrapure materials, and monoclonal antibodies) and assesses their status and trends. It also puts commercial and defense technologies virtually in a single policy basket.

22 Generic Technologies Selected as Critical Priorities in the U.S.

- *Materials synthesis and processing*
- *Electronic and photonic materials*
- *Ceramics*
- *Composites*
- *High-performance metals and alloys*
- *Flexible computer-integrated manufacturing*
- *Intelligent processing equipment*
- *Micro- and nanofabrication*
- *Software*
- *Microelectronics and optoelectronics*
- *Systems management technologies*
- *High-performance computing and networking*
- *High-definition imaging and displays*
- *Sensors and signal processing*
- *Data storage and peripherals*
- *Computer simulation and modelling*
- *Pollution minimization, remediation, and waste management*
- *Applied molecular biology*
- *Medical technology*
- *Aeronautics*
- *Surface transportation technologies*
- *Energy technologies*

In addition, the Department of Defense-DOD issued in early-May 1991 a "Critical Technologies Plan" relating to 21 technologies rated as "essential for maintaining the qualitative superiority of U.S. weapon systems". This plan follows the report issues by the National Critical Technologies Panel (the Department of Commerce has also reported on the most critical civilian technologies, as have several private-sector organizations). Although there is a fair deal of overlapping with the list above, it is more specific and, in addition, it compares the US position with that of the USSR and other countries.

The plan is considered a crucial part of a 'new, long-term, consistent approach" to science and technology "an approach that is flexible enough to adapt to both changing threats in the world and changes in technological opportunity'. It is the third annual Critical Technologies Plan so far

prepared by DOD which has to submit such a plan once a year to the Senate and House armed services committees in consultation with the Department of Energy.

The plan is intended to become an "effective and far-sighted technical, management, and funding tool". DOD is spending U$S 3.1 billion in fiscal 1991 on the 21 technologies, not including classified signature-control spending. Further U$S 0.7 should be added if the Strategic Defense Initiative is counted. Although DOD's overall R&D spending will decline in coming years, critical technologies spending is expected to remain stable or even increase. They get about 50 per cent of DOD science and technology funding in the fiscal 1992 budget request, up from 37 per cent in the fiscal 1991 request (excluding SDI).

For each technology, the plan discusses why it was selected, current and projected manufacturing capabilities, potential benefits, and related R&D. It provides detail on specific milestones for the new few years, and broad technical objectives for the next 10 to 20 years. And it gives more discussion of related private-sector and non-DOD government programmes. It also assesses the US' competitive status versus other nations.

Annex 5

STRATEGIC PARTNERING (I): GENERAL

Strategic partnerships can be seen as an unavoidable and varying feature of sectoral development. They do not necessarily entail a diminished competitive rivalry or the cartelization of technological development, but they do require some reconsideration of the concepts of "industry" and 'markets".

There is a surge in partnering. Examples are Rolls Royce (aero-engines with BMW), Siemens (with IBM in tele-communications); Volvo (vehicles with Renault), British Aerospace (widespread collaboration with General Dynamics) and Phillips HDTV development with Thompson). Many western firms are in their way to forge alliances with Japanese firms, such as Daimler-Benz (Mitsubishi); AT&T (NEC); Texas Instruments (Kobe Steel); or Pilkington (Nippos Sheet Glass). Joint venturing is experiencing a renaissance. In biotechnology partnering is a pronounced structural and behavioral feature. A recent survey based on 100 'high tech" firms in Europe found that 72 per cent were seeking alliances with commercial and R&D advantages as the most common objectives.

As a result, traditional relationships between competitors, suppliers and customers are being rapidly re-defined in almost every business sector, as firms weave increasingly complex alliances both nationally and across borders. These steps follow the wish to counteract perceived threats from the US and Japan in the context of the development of the internal European market, shortening product life cycles, internationalization of markets, globalization of competition, costs of technological development and the need for strategic flexibility in face of fast changing environments. Inter-organizational networking may strengthen suppliers' competitive positions, reinforce entry barriers and speed up technological developments.

A distinction can be drawn between "hard" and "soft" forms of inter-firm collaboration as the following table illustrates.

Forms of Collaboration

"Hard" collaborations	
Joint Ventures	Business agreements whereby two or more owners establish a separate entity. The objectives can vary from research through to manufacturing and marketing ventures.
Contract research	One party commissions research to be undertaken by another.
Pre-competitive research	Programs such as ESPRIT which has included 200 projects involving universities, firms and public sector research centres.
Equity stake	One party takes usually a minority stake in a second party, this being most frequent in the case of established firms taking an equity of generally smaller, research innovative firms in order have access to the science and technology.

Cross holdings	Two major organizations take equity stakes in each other (e.g. Volvo & Renault, Northern Telecom & STC) to demonstrate commitment and to reduce risks of hostile acquisition by third parties.
Merger	The ultimate collaboration, although it make take several years to achieve fruition (eg Unisys in the 1980s or ICL in the 1960s and 1970s).
Licensing agreements	The licensing (usually of technology) to other parties or for a royalty and/or other considerations.
Functional agreements	Marketing, technological and such like agreements aimed usually at achieving a wider spread of activities without incurring the capital costs often associated with expansion (e.g. mutually marketing to achieve global distribution).

Soft collaborations

Relationships	Established relationships between various parties including one's customer and suppliers.
Custom and practice	Long-standing working relationships (eg with well-established suppliers and customers) tend to acquire a degree of mutual understanding and accommodation that amounts to collaboration at a very fine level of detail yet which once shattered (e.g. by changing suppliers) can be difficult to re-establish and corrosive to competitive positions.

The following provides usual reasons why firms may feel compelled to collaborate:

Desired outcome	Possible causes
Market entry	Shortening product life cycle due to rapid technological change and need to secure swift access to major markets to counteract narrowing windows of opportunity. Increasing internationalization of markets.
Market exit	High exiting costs may lead to a gradual approach by reducing involvement in a collaboration (e.g. Honeywell Bull).
Market restructuring	Some overcrowded markets can be more easily rationalized by collaboration leading to merger or acquisitions, thus allowing time to absorb some of the trauma and costs of rationalization.

Defence	Firms may collaborate to form a stronger collective defense against the prospect of competitive erosion from other rivals. Such strategies can encompass a wide range of activities of varying formality and may include competitors and non-competing firms. This strategy often is recommended against entry of Japanese competitors.
Rapid product development	Intense competition and fast rate of technological change focuses on the need to have short development periods in order to market quickly. Co-operative arrangements will not only accelerate the return to technology whose life is likely to be reduced by imitation, but also the commercialization process might be expedited, with the pre-emption of competitors and resultant first mover advantages.
New product development	Collaboration between a firm and its suppliers or its customers can often be the route to development of new products and services.
Rapid commercialization	Start-up firms will not have the in-house capabilities for independent commercialization while the competitive pressures and the desirability of securing quasi-monopoly profits stimulate the search for access to complementary facilities.
Economies of scale	The high costs of technological development, product design, capital plant and marketing lead firms to collaborate to reduce costs and expand markets through mutual access.
Access to technology and experience	The emergence of the generic technologies and the complex interdependence between all technologies drives firms towards collaboration (as well as mergers and acquisitions). Large firms, in particular, are anxious to ensure that they have access to innovative technologies and the experience of how to make best use of them. The information involved can often be difficult to access other than through collaboration of some sort.
Optimization of flexibility	The complex, diverse and unpredictable nature of change may result in a desire to have the optimum freedom to respond to new opportunities. Under such conditions, cooperative agreements are likely to be favoured by internalization.
Risk reduction	The considerable costs of major product development, for example, will lead firms to enter into collaborative arrangements as a means of ensuring against the high costs of failure. Firms may aim to minimize the risk of a failure having a major impact.
Complementarity	To provide a fully rounded offering, firms will enter into partnerships with the suppliers of complementary products.

Standardization	Proactive firms will strive to participate in the development of standards (such as open systems) with the aim of influencing them in a direction favourable to themselves
Synergy	The creation and development of new ideas and opportunities thorough interaction.

Annex 6

STRATEGIC PARTNERING (II): THE CASE OF NEW MATERIALS

The field of new materials can be characterized as generic due to its intimate imbrication with a wide spectrum of industrial sectors and subsectors. They include: i. electronic, magnetic and optical materials, in particular for the microelectronics and information technology industry (including the so-called "functional new materials"); ii. technical ceramics, ie., materials that are formed at high temperature from compounds containing, for example, silicon, carbon, oxygen, nitrogen, aluminium, beryllium, titanium, boron; iii. powder metallurgy, which applies to powder-producing as well as to aggregation and sintering in ceramics; iv. fibre-strengthened composite materials, made of two or more substances where the properties of the composites are superior to those of the individual components; v. technical plastics-chemical materials a number of whose combined properties satisfy particular requirements such as weight, modulus of rigidity, tensile strength, impact strength, melting point, elasticity, chemical inertness, etc.; and vi. new materials such as special metals and alloys, in particular serigraphic compounds aluminium-lithium allows and amorphous metals.

What follows is focused in inter-firm collaborations having a long-lasting effect on the product-market position of the parties and where joint development of new technologies and/or agreements aimed at improved innovative performance are at least part of the agreement.

Nearly 90 per cent out of nearly 700 agreements identified so far were started after 1980s. The increase was gradual up to the mid-1980s, with a sudden jump to over 100 new agreements per year in 1986 and 1987. Later, a levelling off took place, suggesting greater caution and awareness as to the costs and benefits involved.

Technical ceramics is the largest group of new materials, as far as inter-firm co-operation is concerned, with a share of over 25 per cent, followed by technical plastics, and electronic, magnetic and optical materials (see table below). Fibre-strengthened composite materials, powder metallurgy and special metals and alloys make up the three smaller groups of new materials. With the exception of special metals, very few agreements were forged before 1974. Since 1985 over 70 per cent of all alliances in new materials have been found in what have become the three major areas of co-operation: technical ceramics (30 per cent), and technical plastics and electronic materials (each about 20 per cent).

technical ceramics	26%
technical plastics	21%
electronic materials	20%
composites	13%
powder metallurgy	11%
speccial metals and alloys	9%

In many submarkets of new materials large, diversified and integrated materials firms are playing a major role, particularly in high volume markets due to the effects of economies of scale. Small and medium sized firms can play a role in some low volume niche markets, such as in specialty materials, and in those design-oriented areas where small research-intensive firms can play a leading role as innovators.

Annex 7

Assessing the Performance of R&D Labs

The standard nomenclature of government, university and industry and R&D labs is becoming insufficient to gauge their performance, particularly in view of the increased demand for market-oriented research products. The National Science Foundation's funded National Comparative R&D Laboratory Project (NCRDP) is aimed at developing and testing a new typology for the analysis of the R&D laboratory community in the US with a view to facilitate the assessment of the effectiveness of resources allocated to science and technology.

The mix of public/market influence was taken as a basic variable in drawing the taxonomy. Government influence was measured according to the percentage of the R&D budget and expenses for scientific equipment and facilities provided directly or indirectly by the government. Market influence was measured in terms of the extent to which effectiveness was made dependent upon commercial or scientific success (random and stratified sampling procedures were used comprising some 1,500 R&D labs). This way a rich spectrum of alternatives emerged, as illustrated in the diagram below.

The findings illustrate that the mix of public versus market influence allows to draw deeper insights then the conventional classification. (In a subsequent face, the project is also intended to provide insights on the impact of moving R&D labs from one environment to another.) Some interesting findings include:

(i) public technology labs include large numbers of industrial and university labs that are also focused towards commercial objectives;

(ii) over 35 per cent of all university labs classified are significantly or moderately influenced by the market;

(iii) most private technology and market-influenced labs not financed by the government are "small" (under 160 professionals and with less than $8 million of average annual budget);

(iv) at least 80 per cent of the labs of all types, except those in the public science area, identify applied research as a fundamental mission;

(v) fewer than 10.5 per cent of labs with high levels of market influence, consider basic research a major mission, regardless of their level of government influence;

(vi) labs with high levels of market influence are heavily concentrated on the development of prototype materials and devices;

(vii) over 65 per cent of all US R&D labs experience at least a moderate level of governmental influence, with more than one third of them being heavily affected by the government;

(viii) at the same time, market influence is on the rise in many US lab environment: many government-owned labs, particularly the public science ones, have been asked to increase market relevance in their research agenda. Market influence is a factor of some significance

in more than 70 per cent of all R&D labs. Of these, more than 68 per cent are heavily influenced by the market and these account for more than 41 per cent of all those operating in the US. Market influence is significant in almost 30 per cent of all university-owned labs and 44 per cent of all government-owned ones.

ANNEX 8

A levy/grant system versus tax based incentives to R&D

A survey produced some time ago by the Inland Revenue Service on tax incentives to R&D led the UK Government to reject this policy option, in contrast with countries such as USA and Australia. It was argued that the special fiscal incentives increase corporate R&D by an amount that is roughly one-half of the revenue foregone by the Government: the remainder would go to swell companies' cash flow and post-tax profits. So that the findings led to the conclusion that tax incentives to R&D are not cost-effective and, in addition, have a negative impact on public borrowing by reducing the tax take.

Assuming that this findings hold, an alternative has been put forward: it consists of a levy/grant scheme. In this case, all firms in a defined industry growing pay a levy, the sum total of the levy payments then being redistributed to the firms in the industry in accordance with their expenditure on R&D.

This scheme has no impact on the public sector borrowing requirements, except as increases in R&D are offset against corporation tax in the usual way. It boils down to a subsidy to R&D financed by a lump sum tax and its likely to lead to increases in R&D spending.

The reasons for the lack of effective of tax based schemes are usually the following:

(i) Tax exhaustion. Firms who have insufficient profits to incur a tax liability will gain no benefit or incentive from extra tax relief on R&D spending. Moreover, firms paying lower rates of tax (small firms) will get less benefit and incentive than larger firms. The levy scheme overcomes both the tax exhaustion problem and the problem relating to different tax rates.

(ii) Price elasticities. Typical estimates of the price elasticity of R&D are in the range of 0.3 to 0.6. These would imply that the increase of R&D re.ulting from a tax incentive would be small relative to the revenue foregone, making tax incentive undesirable. If, instead, a levy is set at 10 per cent of the average firm's R&D spend, the price of R&D will fall by 10 per cent and the expected increase in R&D will be in the range of 3 to 6 per cent. With a levy scheme there is no revenue foregone to offset against this increase; however, there may be a reduction in the number of firms in the industry and a reduction in the industry output, which should be correspondingly addressed.

(iii) Redefinitior It is commonly argued that the provision of tax incentives to R&D leads to the redefinition of other activities as R&D so that some fiscal advantage might be gained. This implies that any increase in R&D after provision of a tax incentive may be more apparent than real, and increase the revenue foregone. Under a levy scheme firms will have similar incentives to redefine activities as R&D and this may distort the incentives provided by the system. If all firms "cheat" to a similar extent, this will not impact on the reallocation of the levy pool which is based on shares; being industry based, the knowledge of the administrators of a levy scheme may enable more effective policing that is possible with a tax-based scheme.

The levy/grant scheme was used successfully in the UK to promote industrial training (through the Industry Training Act of 1964). The Confederation of British Industries commended it ex-post as having produced a permanent change in the attitude of industry towards training. At the time the scheme was criticized as interventionist and contrary to market forces. However, in this case market failures are paramount so that what is at stake here is what kind of policy intervention is the most effective. On the other hand, because of its industry specificity, the scheme may work in the case of an existing industry but be poor for support of R&D in new industries.

Annex 9

NETWORK OF INTERMEDIATE TECHNOLOGY TRANSFER INSTITUTES: THE CASE OF THE UNITED KINGDOM

A report by the Prince of Wales Working Group on Innovation contains a set of proposals produced during the first quarter of 1992.. A pilot scheme, to grow into a larger network, is going to be soon initiated.

The new centres are going to be modelled on Germany's **Fraunhofer Institutes**. Their job will be to transfer technology from academia to industry in key disciplines such as microelectronics. They will be funded partly by government and partly from commercial contract research.

Unlike existing contract research organizations in Britain, the new centre will concentrate on transferring technology by transferring people. The centres will take on graduate engineers, train them to PhD level in commercial surroundings and allow them to move on into industry.

The Department of Trade and Industry has allocated £2 million for the first year of a pilot scheme. Five centres, probably run jointly by universities and existing contract research organizations, will each take on 20 students in October 1992. They are likely to be called "Newton Institutes".

The working group recommended to build a network out of existing institutions. Money would come from private sources, as in Germany. The Fraunhofer institutes are not massive public expenditure programmes. They work on contract income. Bob Whelan, chief executive of the Centre for Exploitation of Science and Technology warned against trying to transplant the German model and recommended to build on existing institutions.

The labour party, instead, is edging towards building new institutes, with funding coming partly from unspent money already in the DTI's budget. It emphasizes the need for a balance between advanced research and postgraduate training in the new centres. Existing independent research organizations have so far played very little role in training postgraduate engineers. In some of them the amount of research has shrunk so that they have become close to be consulting organizations. The labour party is edging towards building new institutes, with funding coming partly from unspent money already in the DTI's budget).

Annex 10

PBQP: Strategic Guidelines for 1992

1. Profissionalizar a Comunicaçao Social do Programa com ênfase na divulgaçao de resultados;

2. Buscar a participaçao do Movimento Sindical e de entidades de Consumidores, estimulando o debate sobre a distribuiçao dos ganhos de produtividade;

3. Valorizar a qualidade do trabalho, mediante o debate e a implementaçao do Plano Diretor de Formaçao e Capacitaçao de Recursos Humanos;

4. Promover a Articulaçao Internacional do PBQP, especialmente no âmbito do Mercosul;

5. Intensificar a descentralizaçao e o reconhecimento internacional do Sistema de Normalizaçao Técnica e de Certificaçao;

6. Ampliar a mobilizaçao no Programa dos Setores de Serviços, Comércio, Programas Estaduais e Pequenas e Médias Empresas;

7. Aperfeiçoar o gerenciamento do programa, especialmente quanto à implementaçao do Sistema de Informaçoes e levantamento de Indicadores de Mobilizaçao e de Desempenho;

8. Consolidar o Programa nas instituiçoes com responsabilidades permanente nas áreas da Qualidade e Produtividade;

9. Aprofundar a utilizaçao do Poder de Compra na induçao da melhoria da Qualidade e Produtividade;

10. Buscar resultados de curto prazo, de alta visibilidade, de forma a ampliar a mobilizçao e o apoio ao PBQP, através da adoçao de ênfase seletiva aos setores produtores de bens e serviços destinadis às necessudades básucas e para aqueles mais afetados pela abertura do mercado.