

OECD-MCT – Global Forum on the Knowledge Economy  
Policy Frameworks for the Knowledge-Based Economy:  
ICTs, Innovation, and Human Resources

*Ambassador Ronaldo Mota Sardenberg  
Minister of Science and Technology  
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Dr. Herwig Schlögel, OECD Associate Secretary-General,  
Ladies and gentlemen,

At the opening of this Global Forum on the Knowledge Economy hosted by the OECD and the Brazilian Ministry of Science and Technology, I would like to salute the renowned domestic and foreign experts, as well as the senior officials and the technical staff of development-policy oriented institutions who have joined us here – all of them distinguished participants in this initiative.

I wish to thank you for your willingness to join us in the working sessions of the next two days. Our common aim is to engage in an exchange of ideas and experiences, and in the careful consideration of issues with a view to charting new directions for growth and welfare in the new Knowledge Society and the Knowledge-Based Economy.

My remarks will focus on science, technology, and innovation as key elements for the progress of Brazil and other developing countries, as well as for their relative position in a world that is undergoing continuous and profound change.

We are going through a very complex period of international life, in which it is advisable to be prudent, to keep a level head and an open mind. The apprehension and instability which followed in the wake of the indescribable tragedy of September 11 – the

first year of which has just been registered –, have had an extensive impact on international and domestic events, as well as on activities linked to science, technology and innovation (ST&I). This compels us to tone down the optimism regarding the economy and technology that prevailed in the 1990's.

I am not referring only to the political and security crises in the Middle East and the Gulf but also to the increasingly erratic behavior of the world economy. Indeed, in addition to the resurgence of trade protectionism in the developed countries, financial oscillations have time and again negatively affected the economic prospects of emerging countries. In addition to the stagnation of the Japanese economy, may I recall the crises in Mexico (1994), Asia (1997), Russia (1998), Brazil (1999), and the current crises in Argentina, Brazil, and the United States (2001-2002).

New challenges have thus offset previous achievements that, though asymmetrically distributed, tended – as they still do – to further strengthen the global role of research and innovation in the current transition toward a predominantly knowledge-based world economy.

The Knowledge Society, the Knowledge-Based Economy, and the Information Society are some of the many phrases that try to translate the same global phenomenon that is already familiar to the most advanced segments of international life. They describe similar though distinct characteristics of our times and nourish hopes for a better world.

Considering my audience's qualifications, I do not need to belabor the point that, wherever they may be brought to light, and provided they are effectively applied, scientific advances and modern technologies are determinant factors of economic growth. But it would not be superfluous to remind ourselves that the relative status of nations and the social and economic performance of their populations depend upon their degree of participation in the knowledge revolution and in its applications as well as on countries' capabilities to effectively incorporate such advances into their development agendas and to disseminate them in their societies.

This poses fundamental challenges that are not limited to the domestic sphere of each country or to their having adopted generically established models. Rather, these challenges will have to be met by means of detailed negotiations at the international level, focusing on the modes of participation in the global order that will best suit each country, according to its own particular conditions.

As I make these comments, I bear in mind that, in concrete terms, we in Brazil have already reached a reasonable degree of consensus about ST&I's place on the agenda for our future, that is, about how to best steer the lasting, sustainable progress required by our country and by Brazilian society. There is an unprecedented and – we hope — irreversible national effort to promote ST&I, which have been recognized as essential factors, although not the only ones, for our sustainable development.

The changes stemming from science, technology, and innovation—including ICTs—enrich the very concept of citizenship. At the upcoming October elections we shall be celebrating the strength of our institutions and the commitment of our political class and of our entire society to democracy. In all, 115 million Brazilians will directly participate in a fully computerized election process, conducted under conditions of the utmost transparency and respect for the Rule of Law. Beyond exercising the right to vote, the experience of being a citizen in our polity is closely linked with the right to information, which today necessarily includes universal access to modern network communications technologies, such as the Internet.

The task of laying the foundations for the establishment of the Information Society in Brazil in recent years has deserved intensive efforts from the Federal Government, in partnership with the states, the business sector, the academic community, and society itself.

This partnership benefits from a considerable historical tradition. For fifty years, the Brazilian state and society have been engaged in a sizeable effort to build a strong university graduate and undergraduate system and a large, sophisticated , Science and Technology system. This system consisting today of over two hundred-fifty research and

higher education institutions, many of which are internationally renowned, make Brazil stand out among developing countries.

As a result of systematic investment in advanced training of human resources and in fostering research, Brazil's scientific output has greatly expanded its presence on the international scene and may in many sectors be placed, according to relevant indicators, on a comparable level vis-à-vis developed countries.

One apparently obvious fact, which nevertheless fills us with pride, is that of having reached over 10 years the current figure of 97 percent children now attending school. In addition, the number of Brazilian-trained Ph.D. holders has also increased – to 6,300 per year, a 600-percent increase as compared with the early 1990s. We have also achieved a growth rate 3.5 times above world average in terms of articles published in indexed periodicals. We now account for 1.4 percent of international output, a level achieved by only 17 countries.

In certain areas, such as agriculture and animal husbandry, health, genome research, Information and Communications Technology, aerospace industry, isotopic uranium enrichment, and deep-water oil prospecting, our accumulated knowledge and innovation assets have yielded significant social and economic returns.

We have first-rate material and intellectual resources that to a large degree account for the accomplishments achieved so far. As we plan ahead towards achieving the future to which we aspire, we must take into account the patrimony we have already amassed, in spite of undesirable attendant imbalances. Although these results warrant great satisfaction, they also indicate that much more has to be done.

In this light, the current international scene provides some important, specific pointers.

Firstly, we must bear in mind that the conditions—both internal and external—associated with models that were successful in advanced countries no longer exist, so that

such models cannot be simply duplicated by developing countries, not even in the restricted area of S&T policy. We are confronted with a strong, perverse tendency toward world knowledge concentration, which is attested by hard data. The advanced countries account for nearly 90 percent of the world's total investment in R&D, including both public and private funds; the United States' share alone is certainly more than 40 percent of this total. By contrast, investment by S&T lagging countries has decreased in the past decade; this reinforces the adverse trends in the area of international cooperation.

In the Information Era, the traditional social and economic gap between countries and regions is replicated by the Digital Divide and even more so by the contrast between knowledge and know-how, on the one hand, and the lack of knowledge and know-how, on the other.

Secondly, one should also bear in mind that today, Brazilian S&T proficiency is widely recognized, as has been confirmed by a recent World Bank study. Together with countries such as China and India, we rank between the advanced nations and the rest of the developing countries, among which a group of 20-odd countries are on their way to achieving scientific proficiency but have not yet reached it, while some 120 other literally techno-excluded countries (the so-called *lagging countries*), for the most part, neither produce nor consume the technologies developed in more recent decades.

The world-class excellence that exists outside the advanced countries—such as in India, in mathematics and software; in China, in seismology and space research, an area in which we cooperate with each other; in the Philippines, in rice research; in Chile, in astronomy; in Cuba, in biotechnology; or in Brazil, in several well-known areas—may certainly qualify the picture of the concentration of knowledge but in no way invalidates or distorts it.

I would not like to pass over the coldness of the international apportionment of competences. “Being left on the sidelines is horrible,” said President Fernando Henrique Cardoso at the close of the international seminar on *Development in Debate*. This event was held last Friday, significantly, in celebration of the fiftieth anniversary of the National

Economic and Social Development Bank - BNDES. In its extreme form extreme, exclusion certainly induces adversarial behavior and discouragement.

The week before last, I was in South Africa and in Mozambique and was able to appreciate on site the efforts by the former—which, as Brazil, can be considered to be S&T-proficient—and the latter, which is engaged in a truly Herculean effort to overcome the barrier of digital exclusion and, more generally, scientific and technological exclusion. Mozambique's is a truly representative case of the unfair challenge that today's international order imposes on almost the entire African continent.

In Brazil, we have revitalized and reorganized material and intellectual resources and are implementing a science and technology policy according to new paradigms and values. We are fully in the midst of intensifying our national S&T effort, so as to achieve, within a decade, one of this generation's fundamental goals, which is to place Brazil among the advanced nations in the vast field of knowledge and its practical applications.

Incentives to Information Technologies, innovation, and the formation of the so-called intellectual capital—the themes of this meeting—do indeed have a central place on the agenda of the Brazilian Government and of the Ministry of Science and Technology. The success of the National Conference on Science, Technology, and Innovation held exactly a year ago confirmed we were right in choosing those issues as priorities.

The National Conference represented Brazilian society's rallying around this issue and thus legitimated our efforts. Scientists, entrepreneurs, public administrators, and politicians mobilized themselves to assess the challenges to science and technology and to propose initiatives conducive to a new dynamism as we enter this new century.

The recently released *Science, Technology, and Innovation White Book*, which embodies the guidelines, strategies, and lines of action that resulted from the Conference's discussions not only is a clear record of the invaluable legacy President Fernando Henrique Cardoso's Administration has built in the field of science and technology but also points to directions defined by a broad-based consensus.

The very establishment, with multiparty support, of 14 Sectoral Funds to support research had but one crucial objective—to expand the investment base in our field of activity. It also successfully aimed at the institution of a new, effective management model based on a shared decision-making process and focused on the pursuit and assessment of results.

We thus ascribed high priority to the establishment of a Management and Strategic Studies Center-CGEE during the Conference. This Center constitutes a real milestone in this Administration and an evidence of its willingness to coordinate consistent efforts and to provide strategic guidance in the area of science and technology.

The best indicator of the consensus about these ideas is certainly the support we received as we designated the year 2002 as the Year of Innovation.

Obviously, to value and strengthen technological innovation means to adopt an integrated approach to science in its most fundamental investigation areas—the so-called hard sciences –, matching this approach to the need for applying knowledge and for developing technologies.

In brief, the building of an authentic national innovation system requires that all phases of knowledge—from generation to application—be effectively addressed.

The major share of responsibility for scientific and technological development has fallen on the Brazilian public sector along the last five decades. Nevertheless, in view of the clear relation between knowledge application and socioeconomic development, this responsibility is steadily shifting to enterprises. Technological development must be strongly identified with the productive sector and its needs in meeting social and market demands and be aimed preponderantly at creating jobs and generating income.

We have thus worked with determination to create the conditions for a general increase in the amount of available resources for S&T. In the White Book we have set

ourselves the target of increasing , within a decade, the level of investment on research and development from 1 percent to 2 percent of GDP. This will require a doubling of public sector investment and a substantially higher performance by the productive sector, as is usual today in OECD countries.

Specifically, in recent years we have sought to strengthen the interface between the private and the public sectors through effective political, legal, and institutional measures.

For example, micro and small technology-intensive enterprises base will benefit directly from these measures. It is our duty to facilitate the survival and the strengthening of these enterprises as, to a large extent, economic dynamism and the creation of better jobs depend on them. We have taken major steps with respect to enterprise incubation. Today, Brazil ranks fourth in the world in efforts in this field. The *Inovar* Project, which fosters the venture capital market; the FINEP Technological Innovation Award, and support to Local Productive Arrangements are other such examples.

Legislation establishing incentives, a widely utilized instrument in advanced countries to encourage enterprises to invest in research and development, has proven equally decisive in Brazil. The opportunities created by legislation on informatics, for example, have attracted major international companies that produce these high-technology goods, creating specialized jobs and contributing to the growth of the communications infrastructure and the implementation of the Information Society in Brazil.

But changes require the constant improvement of these legal instruments. We have revamped legislation on informatics and accomplished the improvement of the Sectoral Funds' mechanisms, particularly the *Verde-Amarelo*, which has made new instruments available: direct financial assistance to enterprises for R&D; incentives for venture capital investment; and the provision of resources for equalization of interest rates charged on FINEP loans , which should make them more attractive for technologically-based enterprises.

Moreover, new advances will now be made possible owing to recently issued Provisional Measure 66, the so-called “mini tax reform”, which creates additional incentives. A firm that invests in R&D may make corresponding deductions from net profits (earnings taken into account for the purpose of assessing tax income and social contribution on net profits) and thus recover all the investment made.

In addition, the new legislation provides advantages for enterprises as they calculate depreciation of investment on fixed equipment and acquisition of devices, machines, and equipment used in R&D projects, conformity tests, sanitary certifications and records, and industrial property. Enterprises that develop innovative products will be granted further deductions on investment on new, patented products. The fair counterpart required by the Provisional Measure is that deductions can be claimed only by firms or individuals established in Brazil.

Furthermore, new initiatives include the Innovation Bill, which was recently signed by President Fernando Henrique Cardoso and submitted to the National Congress, after a long period of public debate and consultations coordinated by the Ministry of Science and Technology.

The bill incorporates novel proposals, such as establishing partnerships involving public research institutions, researchers, and enterprises; encouraging entrepreneurship and protecting intellectual property; creating an adequate legal structure for innovating enterprises that already exist and for those that will certainly emerge; making public laboratory facilities commercially available; and establishing a government-wide procurement system for high technology items.

The 17 Millennium Institutes, established under a cooperation program with the World Bank and organized under the form of nationwide research networks, have increased the installed lab base. Furthermore, they promote integration at the national level and with international centers, foster the regional decentralization of knowledge and, above all, lead to research excellence.

Also based on the network model, in the next few weeks the Ministry of Science and Technology will add to its structure three new research institutes on such diverse and pressing issues as the semi-arid lands, Amazon biodiversity, and nanotechnologies.

The goal we are close to accomplishing is to strengthen the contribution of research and innovation to entrepreneurship, with a view to opening a new, more advanced cycle of research and innovation. This virtuous cycle is a trademark of modernity and it is by consolidating it that we expect to reach ever-higher levels of both development and social well-being.

What we seek to accomplish is to enhance the state-of-the-art and the contemporary elements of S&T. This we seek to implement by means of a forward-looking vision, by ascribing priority to innovation. This is consistent with the sentiment prevailing worldwide in our field of work. But what is done in Brazil and elsewhere falls also within a scientific and technological tradition with deep historical roots, which originated in the West but has now acquired a global scope.

Ladies and gentlemen,

International cooperation in S&T should be urgently revisited in all its dimensions, aspects, and potentialities, bringing into view a global perspective.

On our part, changes are now under way also in Brazilian cooperation policy, with the diversification of external partnerships in science and technology. The multiplication of opportunities is illustrated by the 23 agreements and memorandums of understanding signed in the last 23 months with international organizations and advanced, proficient, developing, and lagging countries. It is worth noting that all of these agreements call for cooperation in ICTs.

I find it hard to understand that in an era of S&T internationalization, international cooperation efforts should still be timid both in terms of its conceptual basis and of the financial resources it mobilizes. It is urgent that we proceed together to change this

situation and to activate multilateral mechanisms, so as to match cooperation mechanisms with contemporary S&T needs and, indeed, with the global economy.

Cooperation with developed countries, I insist, is certainly valuable, as it may provide access to the frontiers of knowledge and open the way for joint efforts of common interest. On the other hand, we are taking steps to incorporate innovative partnerships with countries of the South as well.

S&T cooperation, more than S&T competition, has an important role to play in regard to developing countries. A good illustration of this is the successful joint development of earth-resources monitoring satellites by Brazil and China.

Long-term international cooperation efforts are needed to mitigate the historical adversity these countries face and to create conditions conducive to their productive, peaceful, and socially acceptable incorporation into the globalization process.

It is common knowledge that the economic and social difficulties faced by developing countries are worsened by the worrisome economic and trade performance of the developed countries themselves. Moreover, as I have mentioned, in even broader terms, the strategic international situation remains a troubled one.

The prevalence of the current political climate might entail countless problems. Instability in the economic area and the real entrenchment that separates peoples are not conducive to an environment that is free of risks and violence. The development of International Law and the practice of relations among States should not take terrorism as their main reference. Neither should terrorism be a reason for creating new barriers to international cooperation in S&T.

In addition to their terrible consequences in terms of suffering and loss of human lives, armed conflicts inevitably entail disastrous economic effects. This is indicated by recent empiric studies prepared by international organisms.

As they demystify the belief that higher expenditures with the military apparatus helps the economy to grow owing to the propagation of investment and spin-offs, these studies show the brutal decline in the GDP of regions affected by violence (e.g., the armed conflict in Sri Lanka between 1983 and 1988 resulted in an accumulated economic cost of 68 percent of the country's GDP), in addition to the damage to international trade flows of goods and services (each two-fold increase in terrorist actions is reflected by bilateral trade declines of about 6 percent). The impact of the global loss of wealth creation and prosperity caused by the security measures adopted after the September 11 attacks is estimated at approximately US\$75 billion.

Moreover, the return of the concern with international security, unseen since the end of the Cold War, shows the paradoxes created by the passive coexistence of technological and economic progress with historical structural problems. The concentration of wealth and progress in the hands of a few countries is perpetuated. This and other constraints disturb the environment in which mankind has to advance.

Brazil is open to international cooperation. Last February, we signed a Basic Cooperation Agreement with the European Space Agency. In April, we resumed our cooperation in S&T with the United States. Next month, we will sign an agreement on the Sixth Framework Program with the European Commission.

As regards the OECD, I believe that conditions are now ripe for us to proceed, starting with S&T, toward taking Brazil to Observer status at the organization. Our cooperative relations are already in place and are moving forward satisfactorily, as this forum clearly shows.

We must persevere, on the basis of our potentialities and national riches. Responding to the challenges we face is essentially up to us —Government, scientists, entrepreneurs, nongovernmental organizations—, all acting together as a propelling, mobilizing force. To advance in the achievements of knowledge and to link them to our economic and social needs is the sure course to solve structural imbalances and to build a better future.

But we must also insist on international efforts, on more open ways to revert the existing inequalities and asymmetries. It is essential to create renewed moral elements and political foundations. Given the evident deficit in world governance and in political and economic leadership, we must persevere in fighting for sustained development, for globalization with greater solidarity, for the strengthening of multilateral fora , the United Nations in particular, and other fronts of mankind's progress that are now in the shadow.

We should not condone the prevalence of a pattern of international relations that allows the debacles such as those experienced by Russia and lately by Argentina, which provoked regressive economic processes and incalculable damage in the field of S&T.

The promotion of reinvigorated, innovative forms of international cooperation—such as the one that led to the organization of this meeting —helps disseminate knowledge and leads to practical applications, while embodying a significant potential for contributing to the prevention of tensions and conflicts, thus reinforcing international peace and security.

I trust these two days of work will prove fruitful and contribute to a collective reflection on the directions of Science and Technology in the Era of the Knowledge Society and of the Knowledge-Based Economy.

Thank you.