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**CONDITIONSFOR SUCCESSFULECONOMICANDSOCIALUSEOF  
INVENTIONS AND INNOVATIONS**

**INVENTIONANDINNOVATIONINMICROANDSMALL -SCALEENTERPRISES**

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## INTRODUCTION

1. Just to avoid possible misunderstanding, I should like to start my presentation with a clear statement on the key role played by the creation of an appropriate environment for the protection of intellectual property rights. In today's world, the protection of intellectual property rights has become an essential component of a healthy growth environment. I should like to take this opportunity to discuss a series of issues that are extremely relevant to the fostering of invention and innovation in developing countries, especially among micro and small-scale enterprises (MSEs), which in my view have been overlooked in the current debate and in policies regarding the protection of intellectual property rights, invention and innovation.

2. In the past, many developing countries have maintained high rates of growth through what has been called "spurious competitiveness." The importation of cheap and depreciated technology, payment of low wages, unsustainable exploitation of natural resources and neglect of the welfare dimension of economic growth were common features of the development strategy followed by many countries for decades. In the pre-globalization world, it was possible to import and use mature technologies without much knowledge or risk. Even semi-illiterate, low-paid workers were able to operate imported machines. Learning capacity and innovation were essential neither for achieving economic growth in a closed economy environment nor for maintaining competitiveness in international markets.

3. The environment has changed dramatically over the last 20 years. Innovation is currently the keyword as far as competitiveness is concerned; in the global markets, dynamic competitiveness is what matters; in the global market era, the economic environment is always shifting in response to various factors, from the introduction of new technologies to changes in consumers' preferences and institutional rules. The pace of innovation has accelerated at an increasing rate over the last decades: new products, launched today, will be obsolete in a few years; in some sectors technological obsolescence is actually measured in months rather than years. In such a context, competitiveness requires the capacity to make timely adjustments and responses to a shifting environment; innovation capacity and management skills are both essential to a firm's survival. It is not enough to buy appropriate, up-to-date technology - and here it is both emphasizing that the purchase of technology is not a trivial thing; I am sure that if we visit the Fifth China Beijing International High-Tech Expo, which was inaugurated this week by Premier Zhu Rongji, we will find many choices of technology being sold at different price levels. Which correspond to a firm's actual needs? Which will still be competitive in coming years? Which offers more development possibilities for the firm? The cost of a wrong decision in this field can be very high even for large companies, let alone for MSEs. Making the wrong technology choices can therefore do more harm to micro and small enterprises than not doing anything.

4. The problem is that, in the current world, choosing a technology requires specific skills and knowledge that most MSEs just do not have. It is not enough to set up sophisticated patent information systems that connect national offices to the whole world if entrepreneurs still do not have access to the most basic technological information that they need for their day-to-day business. One should keep in mind that whereas in developed countries buyers of any type of good can rely on existing consumer protection institutions, in most developing countries these institutions either do not exist or do not function well. Unprepared MSEs are left on their own to confront an aggressive - and sometimes quite unfair - market game for which they have not been prepared. Though I have no hard data to back up a statement on

this issue, anecdotal evidence suggests that the results of attempts to promote these so-called modernization of MSE in Brazil have not been very promising. Again it calls for technology information systems to be strengthened and technological support services to be provided that are tailored to meet MSE requirements.

5. In addition to making the right technology choice, firms must have capacity for continuously adapting the technology to their particular needs and also continuously improving their use of technology assets, in other words innovating. As specialists have stressed, companies can accumulate valuable intellectual property assets and may not be able to take advantage of them.
6. The rapid pace of scientific and technological development; the dramatic reduction of the time span required for developing new technologies and introducing them to the market; the reduction of product life cycles; the increase in research and development costs and also in what has been called “technology risk”; all these factors have created an unstable environment for inventors and innovators. In such an environment, intellectual property protection machinery has become an essential means of fostering investment; on the other hand, the very factors that call for strengthening of intellectual property protection have at the same time weakened the effectiveness of purely juridical instruments as means of protecting the creative effort of inventors and innovators.
7. In such a context, the correct management of intangible assets for commercial success takes on a lot of importance. I should just like to stress that the management of intangible assets cannot be reduced to registering a trademark or patenting a new invention. The best protection that an innovator can have is efficient use of his intellectual property assets, timely marketing to reap the reward for the R&D effort and for the investment in bringing the invention to the market. However, registering a patent may be the easiest step towards making a profit from intellectual property assets. Here is a key issue that I would like to stress.
8. Successful economic exploitation of intellectual property assets requires innumerable other elements, each of a different nature, which are not always available in developing countries. These elements, which include institutions of all kinds and appropriate financing and marketing channels, are crucial to the successful economic exploitation of intellectual property assets. Success in this field is therefore conditional, first, on the wide availability of such elements and factors and second, on the capacity of companies to associate intangible assets with other unprotected assets.
9. Without technology it is impossible to be competitive. Even in the less dynamic sectors, technology and innovation have become essential factors of competitiveness, while knowledge and competence are essential factors of development. Countries should therefore invest in the competitiveness of their people; but they should also invest in providing the conditions in which innovation can take place.
10. Underdevelopment is usually defined by a set of social and economic gaps, which are measured by socioeconomic indicators like income, health and so on; it has never been associated with creativity or entrepreneurial gaps. What is actually missing in most developing countries is knowledge, not creativity, and knowledge is provided by both life experience and high-quality universal education. So, if I were to pinpoint the most relevant action with which to foster invention and innovation in developing countries, I would have no hesitation in selecting education as the first, second and third priorities. It is pointless to set

upsophisticatedincentivestopromoteinventionandinnovationandatthesametimeneglect thebasicandhighereducationofthepopulationasawhole.

## THE ROLE OF MICRO AND SMALL ENTERPRISES IN DEVELOPING ECONOMIES <sup>1</sup>

11. The debate on invention and innovation in MSEs has been focused mainly on the creation and consolidation of new knowledge-based companies. While this is a very important issue, I want to focus here on the conditions for improving innovation in the whole range of existing MSEs.

12. In most developing countries, micro and small enterprises or MSEs have a very important economic and social role to play. On the one hand, they are an important source of employment and occupation, apart from which they account for a significant share of income and may contribute to the technological development of the countries concerned. The universe of micro, small and medium-sized enterprises is significant in most developing countries: in Brazil it represents more than 70 percent of employment and 20 percent of GDP; in Japan, small and medium-sized companies (SMEs) represent 98 percent of the total and in Germany medium-sized firms are amongst the most dynamic exporters. SMEs also play a very important part as far as equity is concerned; in many countries this sector is one of the most relevant in income distribution channels.

## MECHANISMS TO PROMOTE INNOVATION IN MSEs

13. In the 1999 WIPO Conference in Rio de Janeiro I spoke of the conditions for the successful use of intangible assets in global markets from a microeconomic perspective. On that occasion I emphasized the strategic role played by intangible assets in the competitive strategy of individual firms. I also discussed how individual companies, operating in different markets, sought to ensure the economic exploitation of intangible assets. Here I should like to address the issue from a macro rather than micro perspective. Rather than discuss the conditions for successful use of intellectual property assets, I should like to draw to your attention some of the obstacles MSEs face to generate such assets in the first place.

14. The economic environment in which MSEs find themselves is not a friendly one; we can mention at least five obstacles that can be held responsible for the difficulties that they face in order to be competitive and maintain steady growth in the knowledge and innovation society. They have to do with:

- their capacity to invest;
- their management capacity;
- the professional standard of their workforce;
- their bargaining power in the market place;

<sup>1</sup> This section is based on the Brazilian Green Book on Science, Technology and Ministry of Science and Technology and the Brazilian Science Academy in 2001.

- poor product innovation, as in design;
- poor production procedures, which do not ensure quality and low cost.

15. MSEs operating in high -technology fields have to deal with a very harsher environment, generally dominated by large multinational companies; yet they have no alternative: either they innovate or they perish.

16. For most MSEs, invention and innovation do not mean ground -breaking achievements that will radically change the technology in use or lead to the introduction of completely new products. In most cases invention and innovation occurs as a result of trivial observations and ideas as simple and yet as momentous as that of Christopher Columbus on contemplating his egg; in most cases innovation takes the form of small, almost insignificant changes in the companies' production processes or in the products and services that they sell. Though insignificant in terms of their scientific and technological content, these innovations are crucial to SMEs, and can make the difference between survival and demise. The problem here is that even such "insignificant" innovations in products and services still require more than just creativity capacity; they require knowledge and capital, two inputs commonly lacking in developing countries.

17. In the past, invention and innovation have generally been the result of individual talent, ingenuity and indeed genius. While individual abilities are still relevant, even the most talented people would end up frustrated if they could not only rely on a rather complex set of requirements and institutions to support their innovative drive. There is enough evidence to support the view that the MSE sector, for all the difficulties and obstacles faced by individual firms, is a highly creative environment; what it does lack is overall support and also the material conditions to allow the creativity to express itself. It should be stressed that, although the firms are indeed hesitant of innovation, the innovation itself is the result of a rather complex process requiring the intervention, at different stages in the process, of many highly different institutions. A missing link in the innovation chain could render a firm's efforts unviable, futile or at least costlier than necessary.

18. Institutional arrangements for the promotion of innovation in MSEs are needed and have in fact been adopted in many developing countries. The creation of technology parks and poles and industrial districts, the design of policies to strengthen local innovation systems and the establishment of sector -specific technological institutions to support MSE innovation efforts have been used throughout the world, to achieve that end.

## LOCAL INNOVATION SYSTEMS

19. The organization and promotion of local innovation systems is currently one of the main policies being pursued in developing countries. This cooperative -competitive arrangement is an efficient mechanism to help MSEs to overcome the technological bottlenecks that hinder local development. It provides incentives for cooperation between MSEs in the technology field. It also allows for the provision of technological services at a local or sectoral level rather than an individual or corporate level. Finally, it allows for the incorporation of innovative solutions to common problems that result from local experience, as well as the adoption of locally developed technologies.

20. In promoting local innovation systems it is necessary to take some factors into consideration:

- the need to adjust the policy to local needs and local potential. Here, the identification of key bottlenecks – of technological, infrastructure and economic nature – for the exploitation of local resources and potentialities is of fundamental importance;
- the role and potential contribution of science, technology and innovation in local development. Here, scientific technological information plays a relevant role;
- system: the issue here is the identification of alternative technological solutions that can trigger sustained local development;
- the need to enhance the professional capacity of the local workforce and in particular the learning capacity of local operators;
- the identification and strengthening of key institutions for the creation of a pro-innovation environment;
- the key role played by the State and private sector in the creation of local innovation systems.

21. Of the key institutions that are necessary for the support of SME innovation effort, I would like to stress two:

- those that provide basic industrial technology services, and
- science and technology institutions, including universities, research and technology institutes.

## BASIC INDUSTRIAL TECHNOLOGY SERVICES

22. The role of basic industrial technology (BIT) services has been upgraded in the global economy. It is well known that developing countries have increasingly been facing technical barriers in their effort to compete in global markets. Any innovation effort will be frustrated, and some made unviable, if the country does not have a solid and recognized BIT infrastructure. This infrastructure should supply the technological services required for innovation. It should also be capable of attesting the quality of new products and services and their conformity to the standards defined by international trade rules and by developed countries. Whereas large companies can rely on the private provision of such services, SMEs are usually dependent on a publicly -maintained BIT infrastructure or at least on the subsidized provision of these services. This BIT infrastructure is a very important component of a national innovation system, and it goes without saying that most developing countries lack it. Though this issue may be beyond WIPO's mandate, I venture to suggest that it deserves attention and support from international organizations, including WIPO, UNIDO and financial institutions.

## THE ROLE OF SCIENCE AND TECHNOLOGY INSTITUTIONS

23. Science and technology institutions also play a key role in supporting SME innovation. R&D activities are a very expensive and risky business, and that is of course why developed countries have devised a set of policies and instruments with which to foster and encourage R&D at corporate level. With the exception of high technology-based firms, MSEs are not equipped to carry out R&D activities, and yet innovation is as crucial to the smallest large companies. They therefore have to rely on external research capacity. In many developing countries such as Brazil, China and India there has been great progress and achievements in the field of science and technology; they have been less successful with innovation, however, a major challenge is to find a way of linking educational and research institutions to the needs of production sectors, especially in MSEs. It is not a matter of establishing a one-way street from universities or laboratories to firms, but a proper, continuous system of cooperation between teaching and research institutions, on the one hand and firms on the other. In general, public universities in the developing world do not provide an environment conducive to innovation. To change the scientific culture now prevailing in the universities into an innovation and entrepreneurial culture is a real challenge that has to be faced. One should not forget, however, that the main role of universities is to provide high-quality education, which is the most basic input for success in the knowledge society. And it is equally important to remember the role played by basic science in the innovation process. It is foolish to think that innovation can be sustained without being fed by scientific progress in general.

## FINANCING MSE INNOVATION EFFORTS

24. I should like to mention another bottleneck hampering innovation in MSEs. Like other companies, MSEs require working capital to maintain the flow of business; they also require capital to finance the innovation. In both cases they face a great many problems: on the one hand, many cannot provide the real asset guarantees required by financial institutions; on the other MSEs usually have higher transaction costs, which translate into high rates of interest and so forth. While developed countries can provide funds at zero cost to finance R&D (which is allowed by WTO rules), companies in developing countries actually face disincentives to innovation. It should be stressed here that many developing countries have set up fiscal incentives to foster innovation, but it is an instrument that rarely benefits MSEs.

25. One alternative that has been much recommended is that of attracting venture capital. This requires a set of macro conditions that are not on hand in most developing countries, and which take time to be introduced and become credible. Stable and trustworthy rules are not introduced by decree-law but through consistent operation over time. It should be mentioned that the nature and function of venture capital is still not fully understood in most developing countries. Venture capital seeks profitable opportunities for investment, the benefits of which can be rapidly shared with other agents in the market. Its operation therefore requires the identification of such opportunities, and also the making of such institutional and legal arrangements as will provide investors some guarantees regarding the use of their money. In many developing countries there is still a powerful aversion to venture capital, which is commonly looked on as being of the same nature as speculative financial capital, the unstable flows of which around the world have been held responsible for the economic problems in many countries such as Brazil, Russia, Turkey and Argentina, to mention only those.

26. The road leading from a promising idea and even promising research results to business success is a long one. To attract private venture capitalists, research results have to have their

market potential tested; hard evidence has to be submitted that it can be introduced in the market with success. And here too we need a special type of capital, seed capital: while venture capital finances the development of new products and services, seed capital finances ideas, which can then be developed up to the stage at which it has the potential to attract investment from venture capitalists. If it is difficult to gather funds to finance sound, profitable productive undertakings in developing countries, one can well imagine the difficulty of convincing capitalists to finance mere ideas.

## THE ROLE OF INCUBATORS IN PROMOTING INNOVATION IN THE MIDDLE EAST

27. Finally, I should like to mention the role of incubators as a valid means of promoting invention and innovation in MSEs.

28. Lately there has been a proliferation of incubators. In 1985 there were only 200 in the world, most of them operating within technology parks. In 2001 there were more than 3,000, spread all over the world, but still with a high concentration in the United States. In 1995 there were no incubators in China; in 2001 there were more than 50. Chinese incubators are maintained by the Chinese Government with the ultimate goal of promoting innovation and spreading entrepreneurial culture in China, especially among young talented university and postgraduate students. In the year 2000 the Japanese Government also launched an incubator program, its goal to create 200 incubators in five years. In Malaysia the Federal Government has assigned more than US\$50 million to the creation and expansion of high-tech MSE clusters and to the fostering of cooperation between MSEs and universities. In Israel in the last ten years approximately 825 companies have successfully come out from incubators and were responsible for exports of US\$200 million in 2000. In Brazil there were approximately 150 incubators in 2001. These positive numbers not necessarily indicative of successful operation, but they do suggest that we are following the right direction.

29. Incubators are instrumental in fostering the development of knowledge-based firms, which serve to increase local wealth creation, job creation and the use of local resources. They usually offer support for technological development, business and management training, subsidized premises and financial backing and they provide services to help bridge the gap between ideas and marketable products and services. The most common aids used by incubators are (i) training, (ii) legal advice, (iii) subsidized office and research facilities (laboratories) and (iv) financial support in the form of equity and loan capital. The problem here is that incubation comes at a very early stage in the invention process. A risk associated with incubation is usually high, incubators are highly dependent on public financing. Needless to say, in most developing countries incubators struggle to survive amid fiscal constraints and budget cuts, most of them determined by short-term criteria and imposed without considering what is in the countries' long-term strategic interest.

## CONCLUSION

30. MSEs have to be creative to survive. Facing adverse conditions in the global and the national market, MSE consolidation requires effort and creativeness. But if MSEs are to survive, national strategies and policies in support of innovation have to be defined, especially in basic industrial technology services, education, scientific capacity and financing.

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