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IMPLEMENTATION OF THE PROGRAMME ON INTERNATIONAL INVESTMENT AND TRANSNATIONAL CORPORATIONS

Experience gained in technical cooperation:

Commercialization of science and technology activities in transitional economies

SUMMARY

This report describes a programme to assist transitional economies in selling their science and technology products and services in international markets, via business alliances with high-technology transnational corporations. Assistance is provided to both governments and R & D entities, so that (1) governments may support the R & D entities with policies and laws that strengthen the environment in which R & D can flourish, and (2) R & D entities may master international business skills and practices. The programme includes (a) training for managers and officials in marketing, strategic planning/organizational design, negotiation, intellectual property protection, finance, cost accounting and other subjects relevant to market economies, and (b) focused advice on those issues which require attention in the near term (e.g. legislation review, intellectual property protection, identification of potential partners from abroad and marketing outlets, and adopting of certain negotiating strategies). The countries that have been involved in this programme to date include Belarus, Cuba, Estonia, Kazakhstan, Latvia, Lithuania, Ukraine and Uzbekistan.

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INTRODUCTION

1. The technical cooperation activities of the UNCTAD programme on international investment and transnational corporations aim to strengthen the capacity of governments, in particular of the developing countries, in their dealings with transnational corporations and in creating an enabling environment for international investment and for private sector and enterprise development. Operational since 1976, the technical assistance programme has implemented over 1,000 projects in more than 100 developing countries and trained approximately 8,000 national decision-makers and some 2,250 entrepreneurs. The projects alone have involved some $30 billion of foreign investment in developing countries; considerably more has been facilitated by the investment codes and joint venture legislation put in place in many developing countries.

2. The UNCTAD secretariat reports annually on the experience gained in the technical cooperation activities of the programme on transnational corporations, focusing each year on a selected topic. This year's report examines the experience gained in assisting the economies in transition in commercializing their science and technology sectors. The aim of this assistance is to increase their national capacity to market internationally science and technology. The problems involved in this task, the interim successes achieved and the lessons learnt, as well as future directions of the programme, are reviewed in this report.

3. Funding for the technical cooperation and related activities of the programme on international investment and transnational corporations is provided primarily through voluntary contributions of member States and by the United Nations Development Programme. Contributions were received in 1994 from the Governments of China, Denmark, Namibia, Norway, Republic of Korea and Switzerland. In addition, contributions were pledged by the Governments of Algeria and Lebanon. Also, Associate Experts were made available by the Governments of Austria, Belgium and Denmark. A summary of the financial assistance provided in 1994 is given in the annex to this report.

I. CHARACTERISTICS OF THE PROGRAMME ON COMMERCIALIZATION OF SCIENCE AND TECHNOLOGY IN TRANSITIONAL ECONOMIES

A. Origin and early evolution of the programme

4. In 1990, the Government of Cuba requested the Advisory Services on Investment and Technology (ASIT[1]) to send a programming mission to Havana. The objective was to formulate a project of technical assistance to increase hard currency inflows, via foreign investment and trade. At that time, the Cuban Government was searching for new foreign economic ties that could make up for the erosion of markets and suppliers in the former Soviet Union.

[1] This is the current UNCTAD name of what was then a branch of the United Nations Centre on Transnational Corporations. ASIT represents a system of common services with respect to the advisory and training activities of the Division on Transnational Corporations and Investment and the Division for Science and Technology.

5. The initial programming mission identified international commercial opportunities for various economic sectors in Cuba, including tourism, textiles, and health products and services. But available technical assistance funds were not enough to address the needs of all sectors. One sector had to be chosen. Health-care appeared to be the most logical choice because (1) there seemed to be some world class competencies in this area; (2) health-care products had the potential to yield more revenues than other economic activities in a relatively short period of time; and (3) health-care could become a sustainable generator of hard currency revenue in the long term.

6. From 1991 to 1994, with financing from UNDP, the technical assistance programme worked with the Cuban health-care industry in preparing to increase sales abroad. Experts in the highly competitive international health-care industry identified several products and services which could be sold abroad. However, the Cuban health-care industry was not organized to sell abroad. Most important, the skills needed to bring those products to international markets were lacking. Its health-care industry had been developed to provide services at no cost for the Cuban population, without consideration for the international commercial opportunities that could arise later on.

7. A combination of advisory and training activities were undertaken to increase Cuba's national capacity and skills for the conduct of international business operations in today's market economy. Hands-on training was provided on strategic planning, organizational design, marketing, intellectual property protection and negotiation. Problem-solving sessions were offered to potential exporters. Focused advice was provided on setting up marketing functions in the production centres; on giving R & D a market orientation; on formulating a strategy to penetrate international markets and promote the image of Cuba as a provider of high-quality health-care products and services; on organizing to implement that strategy; on setting up a distribution network abroad; on identifying potential partners, customers and competitors; on protecting intellectual property; and on preparing for and negotiating agreements with customers. Marketing brochures were reviewed. Market studies for specific health-care products were undertaken.

8. Other achievements are worthy of note. The advisory reports submitted were translated into Spanish and distributed widely; some training sessions were taped and used for training elsewhere; marketing departments were established and strengthened in production centres of biothechnology products; strategic planning and organizational design were introduced as disciplines to be taught to both managers of production centres and students of economics/business. About 200 managers were trained in marketing, strategic planning, organizational design, intellectual property protection and negotiation.

9. The Cuban programme contributed to the country's ability to identify market opportunities, which should help in the generation of badly needed foreign exchange in the short and medium terms. The knowledge acquired by the Cuban authorities under this programme helped to make it possible for them to enter into negotiations with a number of Japanese and European companies, although the outcome and impact are difficult to assess at this point.

10. In late 1992, a request was received to assist the three Baltic Republics -- Latvia, Lithuania and Estonia -- in selling high technology products and services abroad. Their situation was similar

to that of Cuba: they had good technology-based products to sell, but they lacked the skills to bring these products to the market.

11. After work had begun with the Baltic Republics, other former Soviet Republics with significant science and technology resources became interested in this programme. By the end of 1994, assessment missions had been sent and other assistance provided to Belarus, Ukraine, Kazakhstan and Uzbekistan. In this regard, a comprehensive programme of assistance for the international commercialization of science and technology products and services was developed for Belarus.

B. Structure of the programme

12. To respond to their needs, ASIT, with the financial support of, and in cooperation with, UNDP's Management Development Programme, has been carrying out a programme of activities aimed at developing a self-financing, market-oriented science and technology sector in the transitional economies.

13. Implementation of the programme calls for working with both governments and R & D institutes. Governments must support the institutes by formulating and implementing policies and laws which provide the environment in which science and technology can flourish. The R & D institutes must gather the needed resources and develop the skills to take advantage of market opportunities, both at home and abroad.

14. The programme has a two-pronged strategy: (1) to train managers and officials in relevant subjects, and for those managers and officials to serve as catalysts for change throughout each country; (2) to provide international experts to advise on issues which require attention in the near term (e.g. legislation review, intellectual property protection, identification of potential partners from abroad, marketing skills, negotiation).

15. Activities are executed by a team of international consultants and national experts working very closely together. This approach increases the transfer of know-how to nationals, through both "on the job" training (delivered through focused advice) and formal training. In addition, advisory and training activities are closely linked, supporting one another and feeding on each other.

16. Typically, assistance begins with a desk review of public information on the country in general, and its science and technology resources in particular. A mission is then sent to the country. The mission team meets representatives of government, R & D institutes, production enterprises, the private sector and other parties concerned. During the meetings, the national representatives describe the problems they are facing; they provide information on their resources, capabilities and past efforts. Ideas for the development of high-tech commercial opportunities are discussed. Whenever possible, brainstorming sessions are held on strategy, problem solving and so on. Thus, knowledge on how to tackle these problems is transferred to the nationals from the first mission.

17. After the first mission, the collected information is analysed, and the resources and competencies of the country are compared with those available elsewhere. A written report is then submitted to the authorities. It usually includes an evaluation of the country's science complex

(scientists, research centres, laboratories, etc.); an identification of commercial possibilities; a needs assessment (institutional, human resources and skills) for commercial and managerial development; an identification of market/potential partners and competitors in the international economy; a strategic framework for the development of internationally competitive high-tech products and services; and recommendations for a plan of action. In each case, the recommendations are specific, detailed and operational.

18. The report and its recommendations are circulated among, and reviewed by, pertinent parties, including those visited during the mission. After the national counterparts have reviewed the report, a second mission is undertaken to discuss the report's findings. Then, international and national experts together design the programme of assistance. Thus, in each national programme, the activities are tailored to meet the specific needs and resources of each country. Nevertheless, all national projects have common elements. Some of these elements are described below.

II. **KEY ISSUES IN HARNESSING ACTIVITIES OF R & D INSTITUTES**

A. The problematique

19. Many former Soviet Republics have significant scientific resources. In each of them, thousands of scientists and technology experts work in research and development institutes that are part of a large science complex. Other major institutions in the science and technology sector include the national academy of sciences; various ministries including agriculture, health and industry; and the universities.

20. Until 1991, science and technology in these Republics grew and developed under the umbrella of the former Soviet Union. The central Government was the financier, planner, main client, intellectual property coordinator and sole agent for Soviet science and technology worldwide. In return, the Republics' institutes provided research, product development and in some cases mass production for the whole of the former Soviet Union. Thus, the Republics' scientific communities were able to devote their full attention to research and development. They became increasingly specialized and sophisticated in selected areas, including some which are now crucial for the development of frontier high-tech, high-growth industries worldwide.

21. In 1991 the Republics became independent -- and their R & D complexes lost their main political support, their main source of funding, their markets and the focal point in their system of intellectual property protection. At the same time, maintenance costs for the R & D institutes, including energy, increased sharply, as Soviet subsidies disappeared. As a result, R & D resources are deteriorating rapidly. Many scientists and technicians are being laid off, or they are leaving for commercially more rewarding jobs; R & D projects are being abandoned because of lack of funds; subscriptions to specialized international publications are being cut; and laboratory equipment is not properly maintained.

22. Nevertheless, there remains a good array of outstanding science and technology. Opportunities to benefit from these resources are many. At home, they may be used to upgrade industrial production systems, both in terms of efficiency, product quality and environmental sensitivity. Abroad, increasing international competition is forcing transnational corporations to

scan the world for resources -- including scientific and technological know-how --that will allow them to produce better products at cheaper prices. Under strategic alliance agreements, institutes in the former Soviet Republics could provide scientific and technological know-how to these transnational corporations, in exchange for royalties and marketing and distribution networks.

23. Many foreign companies recognize this potential. In fact, several of them (including major high-tech transnational corporations) have visited the R & D institutes in the Republics and offered contracts to scientists and enterprise managers there. Scientists and enterprise managers, strapped for funding, have signed them. For the most part, however, these contracts are suboptimal when measured against international standards for similar contracts. In fact, many of the scientists are transferring ownership of their intellectual property for a fraction of its value, for lack of knowledge of international standards and insufficient skill in contract negotiation.

24. This lack of business skills has cost the science institutes dearly. For example, some unfavourable licensing contracts transferred up to 70 per cent of the revenues to foreign firms simply for filing patents and contacting foreign companies. The standard international percentage for such work is 10-20 per cent. Over the course of a product's life, this could amount to a loss of tens of millions of dollars, or more, per institute. Furthermore, exclusive worldwide rights are being provided by the institutes to foreign firms without performance standards attached. Normally in international markets, exclusive licenses are accompanied by strict performance standards. For example, the contract may require that a certain amount of revenue must be generated for the licensor by the licensee within a given, short period of time. This is especially important in high technology: if the time to perform is too long and the licensee fails, the opportunity will be lost because the product will have become out-of-date owing to changing technologies.

25. In a few cases, scientists and technology experts may have given key information on a particular application to foreign firms, without standard confidentiality and non-competition agreements. Isolated from world markets for several decades, the scientists and high-tech managers lack both knowledge and experience of international business practices and skills. There is no national institution to provide adequate support. Much work needs to be done for such institutes to take advantage of the potential opportunities available to them. In essence, the national capacity to operate in market environments must be developed.

26. How the economies in transition of the former Soviet Republics will fare in the long term depends to a great extent on the choices they make in the next few years regarding their indigenous R & D resources. It is these resources that can bring the Republics to developed-country status, because of the large amount of intellectual property-based capital they can develop in a relatively short time, for use by the economy as a whole. The alternative is sliding back to a system of predominantly low technology and low value added activities.

B. Overcoming structural weaknesses

27. Strategy. In the transitional economies, strategic analysis is inadequate. Enterprises operate without a well defined and realistic strategic plan. For the most part, strategy is limited to trying to sell the most quantities at a given price. However, a strategy is a many- faceted phenomenon involving a coherent, unifying pattern of decisions. It is a framework through which an organization establishes continuity, identifies and focuses on important goals. It defines external

opportunities and threats, and the entity's internal strengths and weaknesses. A strategy includes the scheme of rewards and incentives to employees, as well as the company's philosophy of relations with customers, the Government, critics, investors and other groups that can affect the business organization.

28. For R & D institutes, a strategy should be a road map, which defines how the institute will achieve a competitive advantage. Without one, the institutes will have, at best, a series of recommendations in no particular order, with no integrated framework and no sense of priority.

29. Management at the institutes and enterprises is well aware of this need to have a coherent strategy. To solve the problem, resources are needed to develop strategic thinking skills, and to establish a system that will permit management to collect and analyse the information (internal and external) needed to design a strategy.

30. Marketing. The marketing skills that are lacking range from identifying markets for products and services, to developing promotional materials, to targeting market segments, to establishing pricing policies, to setting up distribution networks.

31. For example, there is little, if any, market research function to scan the marketplace in order to determine the best markets, possible joint venture partners, product focus, pricing strategies, promotion and other elements essential to a successful enterprise. In fact, the only market research in evidence was to develop a product, put it out on the market and see if it sells. This is the most expensive way to conduct market research and frequently leads to failure.

32. Skills are needed to perform the market research necessary to design and position products and services, package them effectively, target the right customers, reach the right customers and persuade those customers once reached. It is an across-the-board need, from understanding how to frame marketing strategy to implementing it. Without market research, designers are left working on products with features customers may not want, with designs not deemed useful and at prices either too high or too low.

33. No comprehensive marketing strategy was evident on the means to package, price, distribute and advertise products, organize a marketing effort, protect intellectual property used for marketing (such as copyrighting of marketing materials) or systematically and effectively develop markets. In most cases known to ASIT, sellers took a hit-or-miss approach: they tried a couple of things, like a trade show or attendance at a conference. In the highly competitive international marketplace, the difference between success and failure is often very small. In this milieu, the marketing efforts of most institutes reviewed of the former Soviet Union were suboptimal and failure was inevitable without significant but attainable improvements.

34. For example, in most cases, marketing strategy is centered on lower prices. A low-price strategy may be acceptable for shirts and plastic toys, but in many cases, particularly involving high technology, low price is not a very relevant feature. Indeed, customers for high technology products usually want quality, reliability and technical excellence, and they usually view low prices as a signal of inferior quality.

35. A related problem is insufficient focus on costing and pricing. For the most part, producers could not provide costing figures for their products. Pricing was usually referenced to some known price of an existing competing product. The price for the product at hand was almost always set lower, with insufficient regard to the features, advantages, and benefits of the product -- or the production cost. Potential foreign partners need to know costs to determine if a product is or can be made profitable.

36. There is lack of knowledge of how to divide a market into homogeneous sets of customers (segmentation). The skill at selecting the proper set of customers (targeting) is vital to making the best use of the limited resources the institutes possess. Distribution channel margins, tiered distribution, wholesale, retail and other key concepts that refer to how to get a product from the factory into the hands of the customer are also largely unknown.

37. Marketing and promotion materials usually introduce potential customers to a product, service or enterprise. In former Soviet Republics, these materials are poorly designed and printed. Many are available only in Russian and the national language. Brochures in English, the international business language, are often full of errors. Some lack the name and address of the seller. In a highly competitive marketplace, such problems are usually fatal to sales. Indeed, the general attitude of the market is that if the promotional materials are poor, the product or service -- which is much harder to make or deliver -- must be poor also.

38. Most promotional materials reviewed by ASIT were product-focused, extolling the virtues of the products. But to be effective, promotion must be market-focused, extolling the benefits to consumers.

39. Negotiation and other legal skills. Negotiation is a critical skill in commercializing products. The difference between skilful and less skilful negotiators in business agreements can be millions of dollars.

40. Yet the kind of sophisticated negotiation skills needed for effective international marketing are almost non-existent among science and technology managers in the former Soviet Republics. There is a lack of personnel with sufficient know-how to evaluate the legal, financial, market and strategic aspects of proposals from foreign entities and there is no effective system for gaining information on the financial and technological strength of the foreign companies themselves. In addition, there is only limited knowledge of international standards to serve as points of reference.

41. Finance. A lack of knowledge about financial matters is significantly hampering the ability of R & D institutes and enterprises to progress in the effective development and sale of their products. Knowledge on how to raise money (through bank loans, collateralization of contracts, venture capital, bonds, private equity placements, etc.) would enable the institutes to get the basic resources to achieve their goals. Also, cost accounting, or management accounting, is non-existent. Without this it is very difficult to price products effectively.

42. Intellectual property protection. Intellectual property theft is one of the major problems facing R & D institutes in the former Soviet Republics. This property is too often appropriated by foreign competitors because the Republics' scientists and technicians do not secure non-competition and confidentiality agreements or patent protection, nor can many afford it.

Furthermore, there is no system to prevent employees from walking off with research institutes' intellectual property. By contrast, it is standard in developed countries for R & D institutes' employees to sign non-disclosure, non-competition and licensing agreements, protecting the institutes while fairly rewarding scientists. Also, few trademarks are filed. Software programmes often have no copyright protection.

43. Information and communication. Information is the lifeblood of any successful programme, including in R & D, where a key aspect of the development of new knowledge is the development or use of new information. But there are significant problems in collecting information, both from within and outside the institutes. And inadequate information systems translate into a slower response time, inefficient decision-making and lack of sufficient information to make the best judgments.

44. Most R & D institutes have been virtually cut off from the international science community because of lack of funding for science journals in their fields. Without such information, the scientists are shooting in the dark when they try to develop their research programmes. Also, there is little information on international standards and certifications on which to develop products. There is thus a risk of spending resources on products that cannot be sold.

45. There is no effective information exchange between scientists and technology experts in former Soviet Republics and their foreign counterparts. Such an exchange is essential for institutes to become an international presence in science. The need for technology and funds for Internet connections, and funds for trips to participate in scientific meetings, is therefore imperative.

46. Internal information systems also need upgrading. Currently, R & D institutes and their government agencies are unable to share information in a timely and effective fashion. There are insufficient computer links. Those that exist need more hardware and software.

C. Appropriate assistance to governments

47. Government plays a critical role in technological development. In all countries with successful technology systems, government promotes technological development actively, through policies, laws, tax incentives, funding for education and R & D. Such is the case in the United States, Western Europe, Japan, the Scandinavian countries and the newly industrializing countries of Asia[2]. In the former Soviet Union, as noted earlier, most decisions were taken and carried out by the central government in Moscow. As could be expected, the system of institutional development collapsed after the Republics became independent.

48. Since then, the Governments of former Soviet Republics have taken some steps that support R & D. For example, governments have enacted new legislation relevant to the development of an international, commercially viable science and technology sector. This includes laws for foreign investment, foreign trade, taxes, patents, trademarks, copyrights and the like. Some countries are signing bilateral trade agreements with other countries. Most Republics have joined international

[2] For further information see, for example, National Innovation Systems - A Comparative Analysis, Richard Nelson (Editor), Oxford University Press, 1993.

agreements for intellectual property protection (e.g. Europe's Patent Co-Operation Treaty, the Madrid Agreement Concerning International Registration of Trademarks), or they plan to do so[3].

49. For the most part, these laws provide an adequate framework for forming business alliances with foreign companies. However, there are major problems with implementation. For example, official entities are often poorly staffed and have insufficient resources. Often, there is lack of government financial support for the science sector. One reason for this is that the possibilities of science as a stimulus to growth are underestimated. R & D is pushed down the list of government priorities as a long-term prospect, because current resources are enough to address only immediate needs (e.g. energy and food products) or because it is not understood how significant revenues from it are possible in the near and medium terms.

50. The consequences of inadequate policies and policy execution have too often been damaging. At times, privatization initiatives have been counterproductive, if not outright destructive, for the R & D institutes. In some cases, governments have split off effective vertically integrated operations. For example, the R & D arm of an enterprise has been split from the manufacturing plant, which has been privatized. The plant takes the intellectual property of the R & D laboratory, embodied in the products, and it sells them, giving no royalties to the laboratory. As a result, the laboratory is starved of resources, and the plant soon finds that its products are out of date, since the R & D support has disappeared. The same is true with the small private companies being formed by scientists leaving R & D institutes and taking with them the institutes' intellectual property, without any arrangement for royalty payments.

51. Science's existing funding systems are often ineffective. For example, in one institute in Lithuania, research was funded by head count, not by productivity. In an environment of scarce resources, this threatens the survival of good programmes and rewards bad ones.

52. In most Republics, it is not clear who owns and/or has the right to sell science and technology products and services: the inventor, the inventor's institute, or the government that funds the institute -- and which entity in the government. Needless to say, this absence of clarity on ownership is a major obstacle in the commercialization of science and technology. But perhaps the most important obstacle to putting science on a development track is the lack of government expertise and resources to design and implement a comprehensive strategy that would provide solutions to the kinds of problems noted above.

53. ASIT has undertaken a number of actions to promote the marketing of R & D results. Obstacles have been flagged and possible solutions have been offered and discussed with government officials as, for example, in the case of Uzbekistan (see box 1). Preliminary reviews of the laws affecting foreign investment, trade and intellectual property protection have also been undertaken. Brainstorming sessions on national strategic planning have been held with relevant parties in government, State enterprises, R & D institutes and the private sector (see box 2).

[3] The World Intellectual Property Organization (WIPO) has played a key role in updating the Republics' intellectual property legislation, in a way that is consistent with international standards and the Uruguay Round. WIPO is also training staff of national patent offices and the like to increase the national capacity to manage intellectual property.

BOX 1
Marketing Uzbek science and technology:
some key problems and recommendations

PROBLEMS	**RECOMMENDATIONS**
(1) Few marketing skills. The science and technology entities do not have the skills necessary to design, position and package their products and services effectively, target and reach the right customers, and persuade those customers once reached.	**(1) Develop marketing skills**. Introduce training in marketing in universities and other institutes of higher learning. Until the country has its own marketing professionals, consult international marketing experts. Have them work closely with nationals, to transfer know-how and thus increase national marketing capacity. Monitor this process closely, so that case studies based on the country's own experiences may be developed as effective teaching materials.
(2) Lack of market intelligence and research. The only market research method in evidence was to develop a pro duct, put it out on the market and see if it sold.	**(2) Market research**. Do market research before products are designed, and then design the products accordingly. This requires scanning the international marketplace to identify the best target markets, possible joint venture partners, product focus, pricing strategies, promotion and other elements essential to a successful enterprise.
(3) Lack of awareness. For the most part, foreign buyers do not think of Uzbekistan as a provider of science and technology (S&T), partly because many of its products have been marketed as Soviet products. As a result, the "Made in Uzbekistan" label lacks credibility in the international marketplace.	**(3) Improve marketing materials**. Do market research to determine the best message for these materials. Focus on the relevant market and/or customer needs and explain how the product meets these needs. Collect high-quality marketing materials from leading high-technology companies abroad, and analyze those materials. Recruit foreign experts to work with institutes in the development of high-quality promotion materials. To ensure a market focus, use writers that are familiar with what the customer values. The brochure's writer should be fluent in the language of the brochure; if this is not possible, in the least somebody that knows the foreign language should check the brochure text for grammatical accuracy. To be credible, the marketing materials should include third party testimonials; results of objective studies and certifications; testimonials of satisfied customers and opinion leaders; and assessments from independent experts on the high quality of Uzbek goods and services.

PROBLEMS	RECOMMENDATIONS
(4) Lack of adequate materials. Promotional materials are not of sufficient quality to attract serious foreign customers. Many are printed on poor quality paper. Most have faded color. Reproduction of drawings is often poor. There are grammatical errors and instances of incorrect word usage. For example, a brochure stated that "We are ready to help you with solving economical, organization, lawful and other issues of improving your activity and conversion to the market relations". Some brochures do not have the name of the institute, or an address and phone number. Thus, buyers cannot contact the sellers. Many consumers may dismiss Uzbek products based solely on the poor quality of the promotional materials.	**(4) Build awareness and credibility through effective promotion**. Develop a positioning theme for Uzbek science and technology, using the country's long history of exploration, the fact that Uzbekistan started what may have been the world's first Academy of Sciences in the 9th century, its astronomy and its more recent contributions that kept pace with the West for many years. Scientists should establish credentials through articles in peer-reviewed journals, speaking appearances at international conferences, international patents, prizes and personal contacts. This material must be then properly packaged. The effective use of the media -- for free publicity through articles and editorials -- should be learned. This includes creation of news events, writing effective press releases and identifying key trade publications that will print product announcements without charge. It includes writing press releases for the general media on scientific articles in peer-reviewed journals and on patents granted.
(5) Lack of marketing strategy. No comprehensive strategy on the means to determine how to package, price, distribute and advertise products, organize a marketing effort or systematically and effectively develop markets.	**(5) Use a trademark**. One way for Uzbek enterprises to gain more international recognition is through the development of trademarks. Logos should be on all products. Typically in industrialized countries, individual enterprises have trademarks. There are also national emblems, eg. "Made in the U.S.A.".
(6) Lack of market segmentation and targeting. The knowledge of how to divide a market into homogeneous sets of customers (segmentation) and the skill at selecting a certain set of customers (targeting) is severely limited. In fact, the former Soviet Union was usually treated as one market segment and the West as another.	**(6) Put together a strategic marketing plan**. This plan should incorporate marketing aims, overall goals, an effective organization and a clear purpose of how Uzbekistan will achieve its goals.
(7) Inadequate distribution channels and selection criteria. Other than the vague concept of a "dealer" as part of the process, there was no knowledge of the various channels and phases of the distribution process. This includes how to get a product from the factory into the hands of the customer, or what are the criteria to select the right distribution channel. Channel margins, wholesale, retail and other concepts were largely unknown.	**(7) 'Mine' contacts and customers**. Customer and contact managers should be hired and compensated in part based on their success in securing additional sales. Satisfied customers should be studied to determine what other products and services can be sold to them and should be used as a source of further referrals, and testimonials to be included in marketing brochures.
(8) Insufficient focus on costing and pricing. No one at the institutes visited could provide accurate, let alone approximate, costing figures for their products. Pricing was usually referenced to some known price of an existing competitive product. The price for the institutes' products was almost always set lower, with insufficient regards to its features, advantages, and benefits.	**(8) Hire experts, not scientists for marketing**. The scientists should concentrate on doing what they do best, and that is science. Marketing experts should be hired, and promising marketing experts should be trained.

PROBLEMS	RECOMMENDATIONS
(9) Lack of market-driven structure. Most of the enterprises were organized by product or research programme, not by markets. **(10) Lack of a market-oriented focus**. Managers do not put themselves in the shoes of the customer. They also do not understand the concept of the 'fickleness of the customer' or the concept of product-life cycle.	**(9) Promote a marketing culture**. One way to do that is to provide government research funds for applied research based on market criteria: effective business plans, customer orders, positive market research results, third party endorsements, foreign product certifications and the like. Another would be to hold internal trade fairs in which marketing departments buy products from the research departments. Basic research could also be funded based on criteria that might lead to marketability. Articles in peer-reviewed journals, research collaboration with a foreign university, science prizes, seed money from a foreign company or other entity, and so forth should be encouraged. The idea is for scientists to begin thinking about results and revenues. **(10) Improve marketing techniques**. Organize around markets, around the types of customers that would buy various models of the products, and not necessarily geographic areas. Customers often need to be contacted, advertisements pushed, distribution channels strengthened after sales service increased and possibly a strategic alliance formed with a competitor. Have a strategy to react to market developments, such as a surprise marketing campaign by a competitor or his announcement of a technological advance. It is very important for enterprises to perform what is called "scenario analysis" in advance. This means that the enterprises must constantly try to figure out hidden problems and anticipate responses from others, and how these problems and responses will be solved. Such a method is also called crisis planning.

BOX 2: Example of a brainstorming session: Lithuania

A key step in the strategy to improve the strength and market position of countries and enterprises is to identify problems and provide solutions. For this purpose, a round-table was held with senior government officials and science institute managers and directors in Lithuania. The group was led by the Minister of Industry. About 40 individuals participated. By the end of the day, not only had the participants come up with useful ideas, but, more importantly, they also had a methodology for systematic problem solving, easy to replicate and easy to use.

THE PROBLEM

The group was first asked to list problems in commercializing science and technology. They included:

- Lack of common problem-solving among institutions.
- Lack of government understanding of the link between science and money.
- Lack of foreign strategic alliance partners, particularly those who deal fairly.
- Lack of foreign markets for Lithuanian science.
- Lack of practical experience and solutions.
- Lack of marketing and other information.
- Lack of intellectual property protection.
- Lack of integration of science and industry.

DIAGNOSIS AND OPTIONS

A few of these problems were chosen. The participants were then broken up into smaller groups to work on the individual problems. At first some participants were reluctant to engage in what they thought was a theoretical exercise. But it quickly became clear that this was a practical exercise that could produce new and creative solutions.

Problem: Lack of common problem solving

Reasons

- Reluctance to disseminate information.
- Use of compartmentalized solutions.
- Lack of clear definition of problems.
- Lack of coordination.
- Imperfect management system.
- Lack of experience in problem-solving.
- No system of training in management.
- Lack of system to exchange information.

Options

- Provide economic incentives.
- Choose a strong coordination for group problem solving.
- Clearly define problems.
- Establish a body to deal with problems.
- Involve more women.

Problem: Lack of government understanding of link between science and money

Reasons

- Lack of long term strategy by Government.
- Lack of sufficient information on the part of Government.
- Lack of credible Government advisers.

Options

- Use task forces to solve specific problems.
- Meet with minister more regularly.
- Establish a ministry of science.
- Evaluate commercial potential of science and communicate this to the Government.
- Place science supporters in Government.
- Provide a business plan for science to the Government.

Problem: Lack of foreign strategic alliance partners, particularly reputable ones

Reasons

- No resources to gain sufficient knowledge.
- Lack of skills to find the best partners.

Options

- Develop a state information network to reach foreign companies.
- Develop databases.
- Use third parties who are skilled.
- Do more market research.
- Start a coordinated research group for all three Baltic republics.
- Engage in more effective negotiations.

Problem: Lack of foreign markets for Lithuanian science

Reasons

- Low standards of production and quality control.
- Don't know what foreign customers need or want.
- Don't know what prices to charge.
- Lack of information about foreign standards.
- Lack of Western demand for Lithuanian products.
- Lack of information on technical know-how required.

Options

- Sell products at artificially low prices?
- Get guidance from foreign institutions.
- Take part in international exhibits to display products.
- Contact Western science research institutions, for help.
- Seek assistance of international institutions and foundations.
- Look for specific customers to buy Lithuanian products.
- Use foreign experts and advisers for guidance.
- Set up strategic alliances and joint ventures.
- Hold training workshops.

54. Another major obstacle for R & D development is insufficient links among science, technology and industry. ASIT provided to the Governments of several Republics recommendations for a structure of a self-sustaining, self-financing R & D institute system and related science and technology sector (see box 3). The recommendations were based on international practices and included new structures; incentives for scientists and their institutes; license grants and royalty payments; and criteria to allocate government funding. On occasion, recommendations were given to merge some of the activities spread across institutes and production facilities, according to market opportunities (and not to technology, as has hitherto been the case). For example, in Lithuania, a review by international experts in high-precision measuring equipment recommended joining three research and development programmes in fibre optics and concentration on telecommunications.

D. Selective forms of assistance to producers of science and technology

55. The producers of science and technology include R & D institutes under the Academy of Sciences, various Ministries, universities, industries and enterprises in the technology sector. Until 1991, these entities were part of a fully integrated Soviet military and industrial complex. Except for the Russian Federation, the links in the production chain that takes a product from research to production were often spread throughout different Republics: as often as not, one Republic's institute did the research, another Republic's institute designed the application, and yet another produced the goods. In many cases now, science research, development and production facilities are isolated from each other. Domestic, regional and international linkages between R & D, technological applications and production must be re-established in a way that allows these activities to continue and flourish.

56. The technical assistance provided by ASIT has involved in varying degrees more than 75 science and technology entities engaged in basic research, applied research, design and mass production. Their fields of expertise include electronics, physics, chemical sciences, new materials, health and medicine, biology and geology, among others. The assistance has been delivered during missions to the countries, during discussions and round-table sessions, as well as in the form of written recommendations included in reports submitted to them. Follow-up advice is provided upon request. At times, advice initiated in the field continues after the mission is gone, through electronic mail and facsimile.

57. These entities are being assisted in several ways. For example, regarding intellectual property, measures to reduce loss or theft have been recommended. Confidentiality and non-competition agreements have been drawn up for use by institutes in Belarus, Lithuania and Ukraine when negotiating with potential foreign partners (In Ukraine, for example, one institute had signed a confidentiality agreement which did not cover third parties). Institutes have been urged to ask employees with access to key information to sign such agreements. A full-fledged intellectual property protection system has also been recommended. It includes steps on how to recognize intellectual property; how to document intellectual property (which is particularly important for obtaining patents in the United States, the world's largest market, where the first-to-invent is critical); and how to train employees so that they do not disclose crucial information when talking to a potential competitor. In a few cases, assistance has been provided for the filing of patents.

BOX 3
Policies and structure for a commercially viable R & D sector

In 1993, at the request of the Government of Lithuania, the structure of the science sector was examined and recommendations were given to make it commercially viable. The recommendations have wide applicability and have been extended to the other countries in the programme, with minor adjustments.

Under the structure that emerged after independence, a scientist at a government-funded research institute who makes a commercially viable discovery, can take that discovery and form a company with his/her associates. The company then turns the discovery into a product and makes money. Nothing is given back to the government-funded institute. This system tends to discourage science and technological development in the following ways:

(a) The government-funded institute, i.e. the engine of the innovative process, loses a valuable scientist, a promising programme, and funding. Its capacity for innovation, therefore, falls.

(b) The new company which has, in effect, appropriated the government's intellectual property, has initial-- but unsustainable -- success. Indeed, the company does not have the capacity to do research to support its new high-technology invention. So the invention quickly gets out of date. Sales fall.

(c) The research institute, without adequate financial support from the government or the company that appropriated its intellectual property, cannot do the research necessary to support and continuously improve the commercialized product.

Here is a synopsis of the recommendations:

(1) Have the employees sign non-disclosure and non-competition agreements.

(2) If the R&D institute so desires, it can license the new technology, in exchange for appropriate royalty payments to any entrepreneurially inclined employee, with provision for possible future collaboration.

(3) Change the criteria for funding research. Basic research should be funded based on quality of output and programme and applied research should be funded based on marketability of expected output.

(4) Institute a programme to evaluate every basic and applied research project based on the criteria mentioned above.

(5) Set up a revolving fund to loan money to the most marketable science programmes. Have these programmes repay the fund through the first revenues of their efforts. This will greatly extend the resources to fund the country's best science.

(6) Ultimately, R&D institutes need to be organically linked to local industry and production.

58. In one of the Baltic Republics, for example, the director of one of the country's most sophisticated local institutes mentioned in a meeting that he was travelling to an industrialized country the following week, to discuss two of his inventions with a potential partner. The inventions had no patents. The director said that he had been collaborating with this potential partner for years, and that he was a friend; so there was no need, in his view, for intellectual property protection. But ASIT's lawyer convinced him otherwise, and the two patents were filed. UNDP provided the funds for the filing, to be repaid out of the first revenues generated by the inventions (Two days after the patents were filed, the foreign country's Patent Office informed ASIT that the potential partner had tried to file his own patent, using the information from the director of the institute).

59. Promotion materials of the R & D institutes have been reviewed. Customized strategic and marketing advice has been provided to many of these institutes and related high-tech enterprises. In some Republics, technical and marketing assessments have been made of specific products and competencies: documentation provided by the institutes was reviewed; visits to the laboratories and production facilities were made; meetings with scientists and managers were held. In some cases, products were tested in laboratories abroad. Conditions in domestic and international markets were analysed. Some contracts to develop and sell specific products were signed. These included, for example, a strategic alliance between a Latvian company that will develop commercial software and an American company that will market it; and arrangements between two research groups in Lithuania and United States firms to develop components for virtual reality.

60. The largest number of world-class competencies were found in basic research; some were found in applications, and none in mass production. This is not surprising, given Soviet policies and priorities: Relative to most other countries, former Soviet Republics have very competent scientists because the Soviet Union invested heavily in sophisticated R & D for the military. Consumer products were poorly designed because the consumer market did not count. In addition, production machinery and equipment were designed without consideration for either energy efficiency or environmental impact.

61. The former Soviet Republics have the best opportunities in high technology components and devices. But production plants for these devices often had very high reject rates. Under the Soviet Union, this was considered acceptable because profit was not a factor. As a result, most of the manufacturing facilities are not ready to compete abroad. There are also doubts as to how long they will be able to continue to sell their products in the former Soviet Republics, given that their customers are being increasingly exposed to imported (and better quality) goods. Thus, manufacturing facilities must be upgraded. But this requires large sums of money, and there is a lack of know-how on how to raise funds. In principle, privatization could help. But in many cases the decision to privatize has not been taken; in others it has resulted in a change of ownership, without any improvement in management. In others, privatization has been destructive to both the factory and the institute, as noted earlier.

62. The United Nations Industrial Development Organization (UNIDO) is assisting manufacturing enterprises in upgrading their production infrastructure. UNCTAD/ASIT assistance, on the other hand, is focused on the generation of revenues through the sales of patents, technology licenses, research contracts and sophisticated component designs; the revenues thus

generated can be used to upgrade production facilities. The two types of activities are therefore complementary in nature.

63. Assistance has also been provided to the various technology entities to increase their capacity and skills to deal with foreign companies and to respond to market forces, including anticipating and responding to competition. So far about 15 contracts with potential foreign partners have been reviewed, including, for example, a proposed representation arrangement between a Belarus institute and a United States firm concerning a major radio measurement device. General advice on negotiation has also been provided.

64. Contacts with foreign companies which are potential partners for the institutes have been made. This is very important, because the easiest (and perhaps only) way for these entities to penetrate international markets is through business partnerships with foreign companies that can provide what they lack: business skills and market entry.

65. Identifying the right partner is a complex task. There are no general, easy steps to follow. Rather, each potential partner must be identified on a case-by-case basis. ASIT provides such assistance based on its knowledge and understanding of transnational corporations as well as markets. Knowledge of markets is important in identifying the right partner, because the appropriateness of such a partner is determined by the product which is to be sold, where it will be sold, over what time framework and under what type of market conditions.

III. **LESSONS LEARNED**

66. When the UNCTAD programme was first introduced in Eastern Europe in November 1992, it was realized that the United Nations Development Programme had very little funding for long-term projects. So the strategy that ASIT chose was to encourage the R & D institutes to sell products as quickly as possible and to devote part of the resulting revenues to long- term project aimed at developing a sustainable R & D sector in their national economies. However, this approach did not produce the desired results and the strategy was adjusted accordingly. Now, the commercial effort goes hand-in-hand with the strategy of building national skills and R & D institutes to operate in market economies and linking these institutions more effectively with industry.

67. Establishing good working relations between national representatives and foreign consultants has also proved to be quite difficult, and more intractable than in most other countries. One important factor relates to the language issue. For the most part, national representatives and foreign consultants communicate through translators, not directly. Most national representatives do not speak foreign languages well, including English which is universally recognized as a very important international business language. At the same time, high-quality international consultants with the required experience, the will to work under the United Nations umbrella and the knowledge of Russian or other languages of the region are very few in number. Experience has shown that good working relations may be established by including, in every mission team, a national representative who speaks English, is well respected among the institutions to be visited by the mission, and is knowledgeable and enthusiastic about the programme.

68. In the course of implementing the programme in transitional economies, there has been one mission to Uzbekistan, Kazakhstan and Ukraine; two missions to Estonia; three missions to Belarus and Latvia; four missions to Lithuania and no less than eight missions to Cuba, inter alia. Informal discussions and anecdotal evidence suggest that the impact was considerable, despite the relatively short period that the programme has been in existence, on the knowledge gained by entire sectors, Ministries and institutes on improving the skills needed to enter international markets and on improving the effectiveness of their internal systems in meeting their goals. In addition, many projects are ongoing: it takes considerable time to bring a country from a complete lack of international marketing skill and effective commercialization to the point where mutually beneficial deals can be signed.

IV. **FUTURE DIRECTION OF THE PROGRAMME**

69. ASIT plans to expand the reach of this programme in such a way that it will serve transitional economies in their efforts to become more active and effective participants in markets across the world. In the near future, the programme in the former Soviet Republics calls for (a) the development of comprehensive national programmes to build skills and institutions to support the international commercialization of science and technology; (b) contributions to the development of regional links; and (c) contributions to the development of links between science, technology and industry at both the national and regional levels.

70. Some of this work has already begun. A full-fledged comprehensive programme has been developed for Belarus, and implementation will start in the Spring of 1995. The Belarus programme will begin with a training session aimed at developing business plans for the science and technology institutes. Participants will include managers of science and technology entities from Belarus as well as other countries in Eastern Europe and Central Asia. This will promote links among the region's new high-tech business community.

71. The single most effective factor in the promotion of regional links is probably a telecommunications system for the use of scientists, technicians and science and technology business managers. Currently, only a few institutes and individuals in the former Soviet Republics have access to electronic mail. And telecommunications costs remain too high. Efforts will be made to help the Republics interested in this initiative to raise the funds and obtain the equipment and training needed.

72. Finally, ASIT intends to bring this programme also to those traditionally classified developing countries that are interested in a more active and effective participation in world markets, and in increasing their production's value added. This will involve significant modification and customization of the programme, given the rather unique history and experience of the transitional economies for which it was originally designed. A start has been made in introducing the programme to Jordan and a similar exercise is about to begin in Colombia.

ANNEX

TRUST FUND OF THE UNCTAD PROGRAMME ON INTERNATIONAL INVESTMENT AND TRANSNATIONAL CORPORATIONS GENERAL AND EARMARKED: INCOME, 1989-1994

(United States dollars)

DONORS	1989	1990	1991	1992	1993	1994
Algeria	-	-	-	-	-	25,000 a/
Bahamas	-	-	-	500 a/	-	-
Belgium	-	-	-	80,555	-	-
Chile	-	-	-	1,000 a/	-	-
China	20,000	20,000	20,000	20,000	20,000	20,000
Denmark	136,668	176,414	239,337	164,337	244,000	244,000
Finland	118,287	175,263	262,182	-	-	-
France	67,742	80,000	71,795	77,778	-	-
Italy	1,499,985	-	-	-	-	-
Japan	-	161,000	185,202	-	-	-
Korea, Rep. of	-	-	-	-	17,000	17,000
Lebanon	-	-	-	-	-	250,000 a/
Malaysia	-	12,000	-	-	-	-
Namibia	-	-	-	-	500 a/	500
Netherlands	70,320	79,260	341,887	175,475	-	-
Norway	215,641	381,045	325,083	332,889	-	274,397
Poland	-	6,500	13,743	14,250	-	-
Sweden	247,893	529,270	-	-	-	-
Switzerland	200,669	413,463	212,570	389,603	-	230,000
Zaire	500	1,000	-	-	-	-
Zambia	636 a/	-	-	-	-	-
Total contributions	2,578,341	2,035,215	1,671,799	1,255,887	281,500	1,060,897

a/ Pledged, but not yet received.