

CROATIAN PROGRAM FOR INNOVATIVE TECHNOLOGICAL DEVELOPMENT

*Innovations, research and development of new technologies,
products, processes, services and markets have no alternative!
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INTRODUCTION

At present the market economy challenges Croatia to join a successful economic environment - European Union - and strengthen its place in the world. In order to meet this challenge it is necessary to identify, choose and implement scientific and technological policy appropriate for the beginning of the third millennium.

In this introduction we want to emphasize the position that scientific and technological policy, side by side, present a basic orientation of this administration, a pledge for future progress. Besides the orientation towards new knowledge, this Program deliberately directs scientific research towards its applicability, and materialization of ideas into products, processes, services and markets. At the same time the Program does not neglect original scientific ideas, not even if their aim is purely theoretical. However, important work and creative effort are stimulated and focused to feasible results of scientific research that can have a direct and immediate benefit to human welfare. This approach is emphasized for a specific reason. In this hard and difficult world that knows only its selfish appetites, Croatian administration deliberately focuses results of its implementation policy towards the welfare of all Croatian citizens. This Program and daily operational policy for its implementation, contribute to this more than ever before.

The starting point of this Program is a true orientation to create environment for both general and individual welfare. In the context of this Program for strategic orientation, a general welfare implies spiritual satisfaction of the community followed by all comforts of the contem-

porary civilization. However, some restrictions, moral and ethical principles should be embedded, in the course of creating new values, into the conscience and awareness of all scholars, researchers, workers, and ordinary people who use achievements of the civilization.

Finally, this Program deals with the approach to development and operation of technology policy, and it is based on the postulate that innovation, research and development of new technologies, products, processes, services and markets have no alternative in the Croatian economy. It is a slogan for the development of the Croatian innovative technological policy.

CURRENT SITUATION

A planned approach to technological development of Croatia dates back to 1993, and coincides with the beginning of the cooperation of the Croatian Ministry of Science and Technology with the German Federal Ministry for Education, Science, Research and Technology (BMBF). The cooperation was implemented with the Fraunhofer - Institut für Systemtechnik und Innovationsforschung (ISI) and VDI/VDE TZ. The results of that cooperation culminated in the workshop with a working title "Conceptual Approaches for an Industry - Related Promotion of Research and Development in Croatia", held on June 28-29, 1994 in Zagreb. In the same year the Ministry of Science and Technology organized a scientific-business conference "Technology Parks: European Experience for Croatian Development" held on November 3-4 in Brtonigla, Istria.

After the elections held on January 3, 2000 and a subsequent change in government, the Ministry of Science and Technology continued its approach to technological development. The Ministry first accepted and latter organized a conference with a working title "Technology Transfer: Experiences for the Countries in Transition" that was held on June 20-21, 2000 in Zagreb.

Following the international cooperation between the Ministry of Science and Technology and Germany in the area of research organization and development of new technologies, and particularly the creation of infrastructure for such an activity, the cooperation extended to Italian and US partners. In the framework of the Italian Government technical assistance to Croatia, the cooperation on the BICRO Project was implemented through the Italian partner SEED - Services for Eastern Economic Development from Trieste. Cooperation with the United States of America was implemented through the

William Davidson Institute Business School, University of Michigan. WDI elaborated a study entitled *BICRO - Global Project*, as a basis for a subsequent development of BICRO as an institution, and a plan for the Business-Innovation Center in Vukovar.

The entire international cooperation and efforts of a small number of enthusiasts at the Ministry and at Croatian universities have resulted in the organization and effective operation of the following institutions - technology centers: Center for Technology Center (CTT) attached to the Faculty of Mechanical Engineering and Shipbuilding in Zagreb (1996); Technology Center Split (TCS) in 1997, Center for Innovative Technology Rijeka (TIC) in 1997. The idea behind the foundation of these technology centers at the centers of Croatian universities was to encourage research in terms of transfer and creation of new technologies, products, processes, and services. The foundation of technology centers in terms of securing premises and necessary infrastructural equipment, was aimed to the start-up and incubation of knowledge-based small and medium enterprises, and to the application of results of technology research and developmental projects. BICRO (Business and Innovation Center of Croatia) was established in 1998, as a state agency to assume a role of an umbrella institution in the creation of the overall technology infrastructure. In addition to the network of technology centers, the technology infrastructure also implies a financial institution that has a task to finance and invest into the establishment and initial operation of new knowledge-based small and medium enterprises.

At this point we do not want to do an elaborated analysis, but only to state that despite the fact that relevant state actors and academic community (particularly proved by an impressive number of scholars and officials in Brtonigla - 172), have been informed on technological development, not much has been done systematically in this area. The only notion more serious than this one is that even among professionals all efforts (insufficient, as stated earlier) have been belittled and considered inappropriate for conditions in Croatia.

For the purpose of stating facts, we want to add that activities of technology centers, with some exceptions, have been reduced to typical incubation activities. BICRO has never commenced with planned activities, since foreseen seed - funding has not been allocated. The Ministry supports activities of technology centers and of BICRO through monthly payments of overheads, i.e. the Ministry finances activities that do not involve development.

At the end of this short overview about measures taken in relation to technology, we need to emphasize that, following the elections of January 3, 2000, and a subsequent change in Government, a new organization of the Ministry involved a thorough reorganization and creation of a separate Directorate for Technology with a Deputy Minister for Technology. This position of the Minister and the Government is a sign of the completely new quality in the approach to technology development that will be, according to all forecasts, at the very core of all research and economic events in the third millennium.

INTERNATIONAL ENVIRONMENT AND TENDENCIES

The above mentioned postulate “Innovations, research and development have no alternative!” the motto of this Program, has its stronghold and incentive in the global approach to the issue that presents a topic of this material. The agricultural era at the end of the 18th century and at the beginning of the 19th century was replaced by the industrial era characterized by technological achievements such as steam engine, automobile, and telephone... International centers of progress were located in Europe. After the First World War and especially after the Second World War the United States of America literally gathered scholars from all over the world, and became a leading global center of industrial, technological development. That was the first real brain drain.

Realizing that only innovation and research guarantee development, both regional and national, between the 40s and 50s, the USA slowly accepted a concept of innovation centers. Two concepts were established: scientific parks such as the Stanford Research Park in Northern California, and technology centers around Boston; and finally in the early 70s a completely new approach of constructing a complete city in the service of science and development – the Silicon Valley.

Europe followed the American way in its own manner. A current network of technology centers in Europe started in the 60s. We must mention four important parks established before 1969: Heriot – Watt in Scotland, Louvain-la-Neuve in Belgium, Grenoble and Sofia Antipolis in France. Asia accepted a concept of parks in the 70s, Korea (Teodok) and Australia (Adelaide) in the 80s. In 1983 a concept of parks was accepted as a development strategy of the Japanese Government.

This short overview of international trends deliberately ends with examples that particularly emphasize the

motto of this material - innovations, research as a basis for development. These are renowned Asian global miracles of the present: Korea, Malaysia, Taiwan and Hong Kong.

CROATIAN PROGRAM FOR INNOVATION AND TECHNOLOGY

The serious consequence of unfortunate periods of war and its aftermath is, among other things, that Croatian technology lags behind developed countries. It seems that this fact of Croatian lagging behind developed countries has not been given any significance or importance (that it deserves) neither in the political arena, nor in the broad public. A direct consequence of lagging behind in terms of technology is inefficient economy with all its negative material, spiritual and social consequences.

In shaping a strategy of its development each country always asks: What are comparative advantages or dominant resources on which the strategy should be based? It is beyond question that Croatia has appropriate natural resources for development of agriculture, tourism and tertiary, service activities, thanks to its geopolitical position in terms of transportation.

However, many times in different situations it has been confirmed that the greatest potential of Croatia, a small country with less than five million inhabitants, are its human resources. Beyond doubt an average Croatian citizen has a solid and broad education, and in many areas Croatians are top experts on the global level. The data of the Ministry show that the organized scientific research activity engages 4,700 scholars. The same number is registered outside the system of the Ministry. In addition, according to the most recent available data, 70% of the population aged 14-18 are attending high schools (mainly vocational high schools); and 28% of the population aged 19-22 are attending college to acquire either an associate or a bachelor's degree.

Future can be built only on knowledge and expertise. Only capable people and professionals may stop a downhill economic loop, and start a wheel of a speedy progress. Therefore, we agree that human resources are a basis for designing all concepts of economic strategy. This Program creates an environment for active layers of society with the best education and greatest prosperity to find its place in a broad spectrum of creating knowledge-based small and medium enterprises.

Basic Principles of the Program

This Program is based on the experience of successful economic systems, but in some segments it has been adjusted considerably to conditions of Croatian economy and tradition:

- Research and development of new technologies, products, processes, services and markets have no alternative in the Croatian economy;
- Opening perspectives to human potentials, particularly those with higher education degrees, capable of their own personal involvement in the creation of relevant technological future;
- Integration of all research potentials ranging from higher education institutions, public institutes, economic institutes to individuals, including existing infrastructure and premises, as well as establishing new institutions, into a planned research activity that will result in feasible technological solutions and patents;
- Experience of developed countries shows that founding technology centers, technology parks for research and development, is by all means appropriate for Croatian conditions. It is the only correct way to decrease a gap among countries with developed and underdeveloped technology;
- Creating environment and infrastructure to support establishing of knowledge-based small and medium enterprises;
- Establishing an efficient system to support the creation of new technologies, products, processes, services and markets;
- Change in a manner, philosophy of thinking, towards attitudes that would enable Croatian integration into designing, creation and production of new products, technologies, processes, such as biotechnology, microtechnology, communication-information technology;
- Gathering and acting towards a mutual goal, necessity - technological development of Croatia - by all the actors that must and can contribute to this.

A Short Analysis of the Present Program Approach

A project for future technology was launched during the war in Croatia when ideals of the people, including former structures in power, were great. On one hand the state was being built, and on the other, economic blossoming of a new state was expected. It is clear that many commenced projects were not considered in detail, neither in

all their segments, or as a whole. From a present perspective it is easy to conclude that such mistakes, judging from commenced projects that have never been finished, are almost unforgivable. The same thing happened to the project for the national technological development that remained in the stage prior to the establishment of infrastructural institutions. We have to state that only a portion of the infrastructural technology network has been created, and that it is not a shaped and operational unity.

An important requirement has not been fulfilled: everybody needed in this chain should contribute to the integration with the world of more developed technology.

A project for technological development should have had, and it still requires, a firm support by the government, creator of the economic policy, beginning with the initial idea, its promotion to a powerful financial support. Following the creation of a portion of the technology network, Croatian authorities obviously deserted the project and left it to sink or swim. Although they had competence to complete the project, a few diligent employees of the Ministry and staff of the centers could not complete the project, since they had no active support and no support from policy makers. The task of the state administration and the Ministry was to create conditions, pass regulations and design day-to-day operational technological policy. It results that the biggest responsibility for a partial implementation of the project lies on the administration that failed to reach relevant decisions.

The project was also harmed by the absence of active involvement of the entire academic community in the overall project of creating, shaping and operating the technology project. Hereby the Ministry addresses everybody that, in a crucial moment, has not accomplished completely its "oath" that everybody should contribute for the benefit of all according to the best of his/her own capabilities. With all due respect to the most skilled and educated social stratum of every community, we must state that it has been a moral act and a big commitment. Public and organized scientific research and education have a special role in the creation of technological future, but we will deal with this issue latter in the Program.

At this point it is important to mention that an active creation of necessary technological institutions is not after all a task for the state administration, in this case the Ministry of Science and Technology. This role should have been assumed by a separate state agency, founded particularly for this purpose. Project documentation shows that this role should have been assumed by BICRO. Did

this fail to happen due to the fact that the role designed to BICRO was not modified to Croatian conditions, or due to the fact that its establishment has not been completed as planned? At present this is irrelevant, but the fact remains that such a state institution does not exist.

In this partial implementation of the technology project it is essential to grasp a right reason for inadequate functioning of the existing technology infrastructure, disregarding who is responsible for it. The experience of efficiently organized networks shows that the existing network is just a component of a real technology network. In fact this is an important oversight, i.e. a wrong approach that did not take into consideration a purpose of creating technology network, i.e. infrastructure. To make this easy to understand let us say that technology development is based on research conducted by the public, economic or private scientific-research institutions. In the course of designing future technology with a significant participation of the knowledge-based small and medium enterprises there was not foreseen the institutional link among scientific-research institutions (potentials), and possible users of their research (small and medium enterprises in development). Technology centers were not able to complete this task due to inertia related to changing way of thinking of Croatian scientific research institutions i.e. researchers. They have not accepted the reality that a true purpose of majority, particularly applied and developmental research, is a final applicability of research results. In addition, potential entrepreneurs did not know how to use an outstanding scientific-research potential that Croatia certainly possesses. Therefore, it was necessary to found an institution to link researchers with enterprises established within or outside technology centers.

This short analysis of shortages in the former program approach has been deliberately confined to the technical aspect of program approach to technology development, without political and daily "economic" connotations, since such an analysis falls outside the framework and purpose of this material.

CROATIAN POLICY FOR INNOVATION AND TECHNOLOGY

Technology policy as a framework and a manner of operation, it encourages progress, development of a country in a specific segment of economy and life as a whole through creating new technologies, products, processes, services, and markets. This technology policy is focused to the future that brings many changes, some unpredictable.

The following principles have been identified:

- Usefulness and ethics that technologies should be applicable, and increase the quality of life of individuals and community as a whole;
- Incentives for development applying national, regional and local priorities and resources;
- Encouraging only the development of environmentally-friendly technologies;
- Scientific research and entrepreneurial projects related to the development and commercial use of new technologies, should be coordinated with the generally accepted moral criteria, therefore falling under the control of the public, experts and moral authorities.

Basic principles of this Program for Technological Development of Croatia especially emphasize:

- Organized and efficient research with secured funding is the only safe path for future development;
- Continued communication and professional cooperation among all research resources, from innovators - individuals, technology centers - parks, public institutes, economic institutes, faculties to universities, is necessary for the creation of technology system and a prerequisite for technology development;
- A need to change educational curricula and curricula of higher education institutions to adapt to research and entrepreneurship, i.e. training Croatian citizens with a college degree for a tough market race that requires only efficiency and profit;
- Continuing education, learning and training. New technologies and processes necessarily require new knowledge and skills. In reference to continuing education a new infrastructure should be established to include focal points and regional points for specific regional priorities (various production processes).
- Small and medium enterprises, especially knowledge-based SME, are necessary in the promotion of transfer and creation of new technologies;
- Planned and efficient support to knowledge-based small and medium enterprises is the fastest way of integration with countries with developed technologies, and the creation of new jobs, especially jobs that require highly qualified staff;
- Inventive ideas and work enjoy special care and support;
- Innovations, research and development of new technologies, products, processes, services and markets have no alternative.

A crucial task of this innovative technological policy is to translate the essence of this approach into an efficient high-quality system. Therefore we need to repeat that at present Croatia, in terms of technology, largely lags behind successful economies that could be entitled “economies of knowledge”. This technological gap may be bridged by: (1) application, introduction, transfer of foreign or existing technologies, or (2) creation of Croatian technologies, products, processes, and services. In simple and relative terms, the transfer of existing technologies may be implemented by: (1) traditional entrepreneurship, or (2) using a globally accepted model of the so-called transfer institutions as technology centers, parks, and knowledge-based small and medium enterprises. It is important to stress here that when it comes to technology the destiny of small countries, such as Croatia, is to transfer, import, and copy the existing, foreign technological products, processes, and solutions.

The rest of this Program will not deal with traditional entrepreneurship, small and medium or large entrepreneurs and companies, since in their essence they are in purely economic, profit-oriented systems, under the jurisdiction of other ministries.

Bridging the technological gap, technology transfer, organized entrepreneurship of knowledge-based small and medium enterprises, technology centers or other organizations of similar origins, differs considerably from traditional entrepreneurship. Such entrepreneurship largely includes inventiveness and innovative capabilities of entrepreneurs, and has its specific characteristics. Therefore, even in the successful economies this type of entrepreneurship is implemented under the state administration responsible for science.

Croatia must be integrated into a circle of creators of new technologies, naturally according to its capability, capacity, and resources that should be, by all means, allocated separately for this purpose. Croatia should not be merely a site for import and use of technologies resulting from foreign knowledge. Such technology policy should create conditions in which all innovative solutions or ideas (ranging from ideas of individuals to the *Rudjer Boskovic* Institute, the most sophisticated public scientific research institute) form one entity in the creation of a Croatian product. Since a lack of resources makes it impossible to create a spatial entity that will have all the characteristics of a global, and spatially organized technology park, why should we not form such an efficient and functional entity? Croatia is a small country, so why should it not, in

terms of technology, operate as a technology park? Since this is merely an organizational problem, why do not we make this a specific quality of Croatia? Achievements in telecommunications annul spatial separation. Integration of all human resources/potentials from innovators to researchers and scholars of worldwide reputation on one hand; and existing laboratories, research premises and equipment on the other hand (especially inventive entrepreneurs with higher education degrees), is a *condition qua non* of this technology policy. Knowledge-based small and medium enterprises within or outside technology centers are merely common productive and organizational segments of such an entity.

Efficiency of technology policy depends on the establishment of active technology system as a whole, and each component of that system, but also of the state as an important and necessary element of support to this policy. Therefore, having adopted former experience, we have identified the following components and levers of policy for innovation and technology:

- infrastructural institutions;
- instruments of policy for innovation and technology;
- control mechanisms of policy for innovation and technology.

Infrastructural Institutions

The functioning of the overall technology system will result in new technologies in the Croatian economic system with a maximal integration of domestic scientific research potentials, establishment of knowledge-based small and medium enterprises, creation of new jobs for highly-qualified people, and finally in the Croatian technological innovations, products, processes, services and markets. The technology system is comprised of the following infrastructural institutions:

- Research and Development Technology Institute
- Research and Development Centers
- Technology Innovation Centers
- Business and Innovation Center of Croatia (BICRO).

Developing the infrastructural system implies enhancing the existing institutions, and establishment of new institutions such as technology centers, technology parks, research and development centers, and in the future science parks. Nowadays the technological development is based on research and development, therefore these technology - related institutions are under the jurisdiction of the Ministry of Science and Technology.

Research and Development Technology Institute is a core infrastructural institution of the entire technology network. At present it does not exist in any organizational form, and it will be established as a public institute of the Republic of Croatia. Its activities will be financed by the Ministry of Science and Technology. In terms of organization, the Institute will employ scholars from various professional orientations, researchers with an entrepreneurial instinct and predisposition. Activities of the Institute will include monitoring and forecast of global technological trends, focusing Croatian research related to development and technology, consulting in the realm of technology transfer, and practical promotion of Croatian technological production.

Researchers of the Institute will be the first filter for targeted public research related to development and technology at Croatian higher education institutions, as well as public, economic and private institutes. Naturally, that research will enjoy a special incentive and financing by the Ministry. A prerequisite for funding such public research projects and tasks will be foreseeable and secured final results in terms of new technologies, patents, products, processes and services offered by the market. In order to implement research related to development and technology, the Ministry will announce public calls for proposals, in cooperation with the Institute, of similar type as calls for proposals for basic and applied scientific research projects. It is implied that economic and private institutes or research units, outside the research financed by the Ministry, will have their own rules and filters.

Research and Development Centers are research units attached to centers of universities and polytechnics, and their task is to carry out research and solve specific regional and local technology issues. The founders of a center for research and development are usually regional and local entities (universities, polytechnics, counties, cities, municipalities, interested economic entities), or the Ministry, but that requires a special decision. The Ministry of Science and Technology normally supports activities of a center for research and development through covering operating costs (overheads). Users of the research activity carried out by a center for research and development are its founders and the entire community, especially in terms of technology projects with a public funding from the Ministry. Centers will compete for those projects on an equal footing. Following the logic of the economy and the existing needs, future developments foresee *Technology Innovation Centers* attached to the Research and Development Centers.

Technology Innovation Centers are centers of excellence founded by a university or a faculty (higher education institution within a university), supported by the local government and economic entities. These are basic infrastructural institutions used for materializing ideas, innovations, new knowledge, and results of scientific research projects and research with public or private funding. In terms of organization, Technology Innovation Centers are basically incubators for knowledge-based small and medium enterprises. Their specific quality is that they are incubators for knowledge-based small and medium enterprises, and not traditional entrepreneurial small and medium enterprises. Business activities of knowledge-based small and medium enterprises within the framework of Technology Innovation Centers, are closely connected to their own innovative and research undertakings, and/or result from the abovementioned scientific research projects and research. Experience of countries with developed technologies often show that owners/co-owners, i.e. founders/co-founders of the knowledge-based small and medium enterprises are scholars, researchers that participated in research projects or research. The purpose of founding a center for innovative technology, and operation of the incubation knowledge-based small and medium enterprises in their premises, is a convenient use of the infrastructure, laboratories, phone lines, accounting services, secretarial service, contacts with domestic and foreign partners. In a principle, the foundation of knowledge-based small and medium enterprises, production start-up and a complete functioning including marketing and product sale, judging from global experience depends on the type of production and lasts from three to five years, often seven even ten years. Following this period, incubated knowledge-based small and medium enterprises, at that point accomplished and successful enterprises, leave a center for innovative technology and join a market race. In the period between the foundation/ start-up, and the final product i.e. full operation of the knowledge-based small and medium enterprises, the Ministry provides financial support through specially allocated resources that fall under the activities of the Business and Innovation Center of Croatia, and therefore we will deal with this issue latter.

This technology policy encourages the youth with associate and bachelor degrees to become inventive, participate in research and develop business and entrepreneurial spirit already during their education. Particularly these circles are expected to found knowledge-based small and medium enterprises, and use services of Technology Innova-

tion Centers. Therefore, the Ministry supports operation of Technology Innovation Centers through co-financing operational costs (overheads), but not development. The experience shows that each country has to use its specific qualities. This technology policy aims to have results exactly in this segment, and use Croatian resources for the individual and common benefit, the youth with broad education and college degrees.

Business and Innovation Center of Croatia (BICRO) is a government institution, established by the Government of the Republic of Croatia, under a direct jurisdiction and within the system of financial support of the Ministry, through co-financing operational costs (overheads), but not development.

This technology policy assigns BICRO a very important role in the implementation of the program for creation and development of knowledge-based small and medium enterprises. BICRO is actually a coordinator of the Program for knowledge-based small and medium enterprises. To be specific, its tasks are related to professional and financial monitoring of the creation, development and final formation of knowledge-based small and medium enterprises. In a full sense it implies overall assistance in the creation of the knowledge-based small and medium enterprises, including consulting; analysis of the entrepreneurial plan, investment project, business strategy and organizational development; providing financial resources; identifying domestic and foreign partners during the foundation and final formation and marketing of its products or a whole company in Croatia and abroad. BICRO offers services that are similar to those offered to knowledge-based small and medium enterprises, to existing companies engaged in the transfer and improvement of technology, and to innovators. The Government of the Republic of Croatia continually provides financial resources for this purpose. Co-financing is expected from regional and local communities and interested economic entities. In the implementation of this function BICRO relies considerably on Technology Innovation Centers, as well as on other public or private institutions, and they present a framework for the creation of a flexible and open network of transfer institutions focused towards the development of knowledge-based small and medium enterprises.

Technology System is an integrated system in terms of organizational infrastructure and operation. It consists of the Research and Development Technology Institute, BICRO, Technology Innovation Centers, and other rele-

vant institutions, Therefore among active members of the Research and Development Technology Institute there will be at least one member of each infrastructural unit, i.e. institution, although they will not be at the same location. They will be considered as employees of public institutes in the full sense of the word, including obligations and a right to a salary. This will ensure both vertical and horizontal links, a real organizational and active technology park. This organizational and functional unity, uniqueness, will be established by decrees on the foundation of the Research and Development Technology Institute, and Research and Development Centers, or by amending acts on founding technology centers and BICRO.

Establishing technology infrastructure, infrastructural institutions in a described manner, apart from the most important goal of a uniform activity on the creation of future technology, has another important characteristic or reason. Independent operation within the framework identified by the Government is an important prerequisite for success. In this manner research in the area of science and development will enjoy creative freedom, from an idea to a finished product, developing inventiveness in the service of individual and general welfare. Through the Ministry, the Government will act as a mechanism for control of spending taxpayer money, and for the creation of environment for a successful technology system. Up to now the Ministry sponsored and directly implemented the entire activity related to both the ideas and implementation in this area. A firm position of the Ministry and global experience definitely show that this is not and cannot be a task of the state administration. This technology policy corrects that wrong approach. State administration, the Ministry of Science and Technology, sees its place and tasks in the framework of the instruments of technology policy.

Instruments of Policy for Innovation and Technology

This technology policy provides for a planned state support to the orientation towards development of the knowledge-based small and medium enterprises. Its final products are economic and entrepreneurial advancement and results of planned scientific research. Instruments of technology policy are measures that will and may be modified or expanded, depending on the economic development and needs of the country:

- Regulations related to the knowledge-based small and medium enterprises;
- Technology Field Council at the Ministry;

- Financing scientific and developmental technology projects and research;
- Financing technology infrastructural institutions;
- Financial support for founding, development and operation of knowledge-based small and medium enterprises;
- Promotion of knowledge-based entrepreneurship;
- Education, training for the needs of the knowledge-based entrepreneurship;
- Support for the associations of knowledge-based small and medium enterprises;
- Support to “traditional” inventive and innovative activities.

Regulations related to the overall issue of small and medium enterprises are still partial. They do not even mention knowledge-based small and medium enterprises. Previously mentioned special characteristic of knowledge-based small and medium enterprises is emphasized again here due to its solid foundation in research and inventive work. Within the framework of passing national regulations, the issue of knowledge-based small and medium enterprises will be regulated by joint and special regulations. This falls under the jurisdiction of the state administration, i.e. the Ministry of Science and Technology.

Technology Field Council, i.e. its creation and operation is a prerequisite for implementation of technology projects and research. Its creation is a matter of organization under the jurisdiction of the Ministry. A close link between activities of the Research and Development Technology Institute, and Technology Field Council has been emphasized. The Research and Development Technology Institute, within the framework of its research activities, estimates the overall Croatian national and regional possibilities for integration into national and global technology trends, in terms of technology transfer and its own production possibilities. Such research activities, and they are among the reasons for the foundation of the Institute, dictate an obligation to focus scientific and developmental projects and research in Croatian scientific-research institutions. Having accepted merely this limitation, that in reality levels with agreed and argued decision-making, the activity of the Technology Field Council is completely independent within the framework of its authority, similarly to other field councils for scientific-research activity, so it falls under the same regulations.

Financing scientific and developmental technology projects and research is in a full sense financing the creation of Croatian product with a high proportion of intel-

lectual work. Abundant financial resources would enable Croatian researchers a possibility to participate in the improvement of existing technologies, introduction and creation of new technologies, products, processes, services and markets. Financing is channeled through the Ministry, as a control mechanism of technological orientation and progress, recognizing full autonomy and freedom of research. The Ministry cooperates closely and accepts recommendations of the Research and Development Technology Institute in relation to allocation of funding for research at registered scientific-research organizations.

Financing technology infrastructural institutions is a direct assistance to development and functioning of those institutions through co-financing of necessary costs related to research. This assistance is obligatory, especially in the environment of a fragile economy. In addition, this logical co-financing is a control mechanism of the Ministry over those institutions in terms of limiting planned activities to research and technology and the creation, developing and operating knowledge-based small and medium enterprises. The Research and Development Technology Institute, and employees of institutes located in infrastructural institutions have a special way of financing. As it was stated earlier, their activities are completely financed by the Ministry. Such financing requires special authority of the Ministry, as regulated by a decree on founding the Research and Development Technology Institute.

Financial support for founding, development and operation of knowledge-based small and medium enterprises is a new category, although the Government of the Republic of Croatia by approved this idea its conclusion dated March 18, 1998. It is an instrument, a technology policy measure that Croatia uses to join the economies of knowledge in the most direct way.

This measure provides a real support to entrepreneurial projects based on new technologies and products. Results of scientific and developmental research are implemented through the production activity of knowledge-based small and medium enterprises. Those financial resources support their founding, development and final formation. However, the logic of the economy lies not only in the introduction and creation of new technologies, products, processes, services, and markets, but also in the improvement of the existing ones. A portion of foreseen and secured financial resources is used for this purpose, i.e. for activities of existing companies outside technology centers. In addition, innovative ideas of individuals, innovators, are also financed from these resources up to the level of a

prototype, in case that the innovator, apart from his/her innovation, does not possess entrepreneurial spirit to establish a company. Two last types of financing, innovative improvements and prototype solutions, become prominent for another reason and that is the fact that regional and local communities have to deal with the problems of existing local companies, and they in addition to the state and the Government in reality finance technology development. That is to say that resources for described support are provided in the state budget, budgets of regional and local administration and self-government, and interested economic entities.

Young researchers (recent graduates) enjoy a special attention within the financial support system in order to set up their own business or use their knowledge being employed by companies established in such a manner.

Direct financial support from the state is used for example for direct loans, non-repayable funds for projects, guaranteed loans or other types of direct support. In order to secure instruments of public support to the introduction and creation of new products and technologies, specific financial instruments for their financing are created e.g. various investment funds, such as a seed-fund or risk-capital fund. Procedure and manner of use of resources and creation of funds, if necessary including other institutions from the region, will be regulated by separate legal acts. BICRO drafts such acts and submits them to the state administration. BICRO has jurisdiction for the actual implementation of the technology policy instrument.

Promotion of knowledge-based entrepreneurship is an important link in their creation. Promotional activities are implemented at all levels, from national to local, including various media. A special importance is given to a planned, educational promotion, even through special educational topics or instruction units. Promotion and acquiring knowledge during education directly encourage founding of knowledge-based small and medium enterprises, since, as it has been previously emphasized, Croatian citizens with a college degree are expected to found such companies.

Education, training for the needs of the knowledge-based entrepreneurship is a prerequisite for a successful economy. In the course of the entrepreneurship era the force of new knowledge multiplies itself. However, diversity of necessary entrepreneurial knowledge and skills is not always correlated to inventive capabilities of entrepreneurs at knowledge-based small and medium enterprises.

Entrepreneurs learn just a portion of needed entrepreneurial skills and activities through a service, or have them made by BICRO or Technology Innovation Centers. Therefore this technology policy emphasizes the need for a foundation and operation of a center for continuing education, and the allocation of separate funds for this purpose in the state budget.

Support for the associations of knowledge-based small and medium enterprises is an instrument of technology policy that gives a special importance to knowledge-based entrepreneurship. Communication of freely associated entrepreneurs from knowledge-based small and medium enterprises, is a safe path to the overall concept of the present technology in Croatia, and mutual cooperation in the creation of the future. The Ministry separately covers costs for attending organizing conferences and study visits by members of those associations characterized by science and development.

Support to “traditional” inventive and innovative activities complements the Croatian Program for Innovative Technological Development in its full context. Therefore it is treated as a separate instrument of technology policy. Everything begins with a “big idea” born in a head of a “big small man”, with more or less education – an ordinary person. A final implementation of the idea is for the benefit of ordinary people. This technology policy uses resources of the Ministry to co-finance all the needs of the “traditional” entrepreneurship of ideas through the above mentioned modality, naturally according to capabilities and depending on the state of the Croatian economy.

Due to the complexity of the innovative entrepreneurship, innovators and stimulation of innovative activities will be implemented through projects in coordination with the Ministry of Crafts, Small and Medium Entrepreneurship, from the initial stage of an idea to the entrepreneurial implementation in manufacturing.

Control Mechanisms of the Policy for Innovation and Technology

Control mechanisms have been established for the overall operation of the technology infrastructural network, distribution and spending of allocated resources, and ethical control mechanism in research, or the commercial use of results of scientific and developmental projects and research. Some control mechanisms, Interdisciplinary Control Group and the Ethical Committee, are organized according to valid national regulations.

The Ministry of Science and Technology is organized to control all segments of scientific and developmental research in all fields, including technology, and spending of allocated resources. In the same manner, as a responsible state administration it controls functioning and activities of infrastructural technology institutions according to separate authorities pursuant to the acts on founding institutions.

Interdisciplinary Control Group is a separate control mechanism under development. It controls the use of resources supporting improvement, introduction and creation of new technologies, products, processes, services, markets, as well as innovative activities. Authority of the control arises from resources for support allocated from the state budget for funds under the jurisdiction of BICRO. Activities of the Interdisciplinary Control Group are coordinated by the Ministry, and the members are representatives of the following ministries: Ministry of Science and Technology, Ministry of Economy, Ministry of Crafts and Small and Medium Enterprises, Ministry of Tourism, Ministry of Agriculture and Forestry, Ministry of Finance, Ministry of Environmental Protection and Urban Planning, and the Ministry of Culture and Sport.

The Ethical Committee will be established and attached to the Ministry to control compliance with the principles of this innovative technology policy: "Scientific research and entrepreneurial undertakings related to development and commercial use of new technologies should be in accordance with generally accepted moral criteria and therefore under the control of the public, experts and moral authorities." The Committee will be established despite frequent criticism that ethical committees restrict freedom of scientific research, since this Program implies the materialization of results of scientific research. The purpose of creating new technologies is their usefulness for individual and general benefit. Nobody has the right to materialize results of scientific research or import such results if they annul this purpose. Therefore the firm position of the Ministry is that all scientific and developmental projects, research, and the creation of new technologies, as well as the overall activities of the Ministry, will be transparent to the public and under the ethical control of experts and moral authorities.

INSTEAD OF THE CONCLUSION

The Ministry of Science and Technology has a special role in the overall experience of modern, successful and market-oriented economic system. This program approach

meets the requirements that, following the logic of things and commitments, face the Ministry in the area of technological development. Such a commitment is emphasized in research that confirm the generally accepted notion and position that new technologies will be at the top of all economic events of the third millenium.

Accepting the motto "Innovations, research and development of new technologies, products, processes, services and markets have no alternative," the Ministry is taking Croatia closer to the systems of economies of knowledge that are considered to be technologically developed. However, the speed of this approach depends on the general awareness that technology development, integration with technologically developed countries, is the only safe way of increasing the quality of living.

An exceptional human potential in the organized scientific research and outside that environment, people with a college degree, especially youth and inventive people with various educational background, now have a chance to use available scientific research premises and premises that will be constructed, to use the existing equipment, and the equipment that will be purchased, to focus their creative effort in a stimulating manner towards achieving results of scientific and other research directly and immediately contributing to the welfare. This general approach of mobilization followed by personal satisfaction of creating individual and general welfare, requires an active and operational technology system.

This Program identifies framework for the overall technological infrastructure of a technology system, with a basic emphasis on research and development of new technologies, and the creation of knowledge-based small and medium enterprises, carriers of production programs resulting from research. In a nutshell, the system stimulates the relation among the idea, research, and prototype - improvement of an existing or a new product.

Devised technology system may function only if it enjoys a continual support by stimulative and necessary financial resources. Financial resources will be allocated in the state budget, Science and Technology Foundation, budgets of regional and local governments, or self-governments, and interested economic entities. Taking into consideration the state of the Croatian economy, the implementation of the Program requires initial funding in the amount of 100 million Croatian kuna, and plans for the increase according to the economic development of Croatia. In case that less resources are allocated, it will multiply a slow down of expected results.

Finally, it needs to be emphasized that the Ministry of Science and Technology, as the state administration, in relation to the operation of the proposed technology system retains only tasks or a role of creating necessary regulations, control over spending, distribution of financial resources, and pursuant to authority arising from the foundation acts, monitoring the activities of infrastructural technology institutions. In this manner, full freedom is achieved in terms of creative work of scholars, researchers and operation of economic entities that arise from the implementation of this program approach.

The program orientation towards the Croatian innovative technological development is in its essence constant, while the operational innovative technology policy is subject to overall, especially economic conditions in Croatia.

GLOSSARY

BICRO - Business and Innovation Center of Croatia
RIC - Research and Development Centers
RITI - Research and Development Technology Institute
TIC - Technology Innovation Centers