

Information and Communication Technology in the Strategy of Development of the Republic of Croatia

(Executive Summary and Recommendations)

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Croatia in the 21st century

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Executive Summary

Information and communication technology enables the transfer and usage of all kinds of information, represents the breakthrough of current generic technology and is the basis of economics and society of the 21st century. This technology is a generator of change in all spheres of society. It is also the basis for successful business activities and is applicable in all fields of the economy and science. Therefore, it should be the basis for the economic and social development of Croatia.

Easy access to information and knowledge provides the opportunity to make good decisions regarding business, state administration, education, health, and personal life. Distance will no longer be an obstacle to communication, learning, business and health care. Every citizen should not only be able to have access to information and knowledge but also be given an opportunity to create new information and technology.

The GDP rate per capita strongly correlates with the level of education and allocations for education, because technology can be used for economic growth only if an educated workforce exists. Therefore, it is necessary to produce a high number of experts each year that create and use new technology.

Missing the opportunity for the development and innovative use of information and communication technology would also be a missed opportunity for Croatia to join contemporary, developed and civilized society.

What are the strategic aims?

1. Information and communication technology should contribute to the economic growth of the Republic of Croatia, and to an increase in employment and expansion onto new markets.
2. In the next five years the Republic of Croatia should join developed countries in the research and development of information and communication technology and learn how to use it to create new products and services in order to make it a significant source of revenue.
3. With the development of electronic administration based on the usage of information and communication technology, the quality of services offered to citizens and

companies should be improved significantly in terms of the overall improvement of state and county administration, local administration and public services.

4. Through the construction of a cheap, fast and safe information and communication infrastructure, the needs of citizens and the economy should be satisfied.

The realisation of these plans will take the Republic of Croatia into an information society, i.e. a knowledge society, thus bringing it closer to developed countries, especially the European community.

What are the funds and time needed to achieve these aims?

The suggested development strategy indicates that the budgeted plans are feasible and gives recommendations with an action plan of how to achieve them. Most of the activities that should be carried out to achieve the aims do not require any investment or could be financed by retargeting the existing sources, and can be achieved in the short term.

Feasible and low-cost activities

The Croatian economy, in the area of information and communication technology, is completely privatised and operates successfully. Several large and a number of medium and small-sized enterprises value innovation, which is an important starting point for the development of new products and services. Such an economy does not need any special conditions or funds, but rather measures to support entrepreneurship and the provision of more favourable and stable business conditions as soon as possible.

The Croatian telecommunication market is capable of liberalisation and dynamic development without burdening the state budget. The technological level of the telecommunications network and the level of professional experience at the time of privatisation, which is significantly better compared to other transitional countries, the dynamic development of the mobile network of two competitive operators with more than 600 newly employed workers and the speed of diffusion of the Internet in the academic community, support this statement.

Information systems have been implemented in a number of state institutions and public services. Connecting, networking and usage of their databases supported by appropriate

legislation will significantly improve the activities of state administration and public services. This can be done with existing experts and minimal investments.

Long-term and high-cost activities

Long-term activities, which are a condition for the achievement of these aims, are related to education. It should be emphasised that our experts in the area of information and communication technology are highly rated in Europe and the world and perform the most complex activities of research, development and production. However, their annual production level does not meet even current demands, not to mention a significant expansion of activities. We do not have, nor do we educate, top quality managers capable of working with high technologies. We should bear in mind that these problems cannot be solved by short-term and partial education, but rather through immediate and comprehensive school reform.

However, this does not require large investments, especially in higher education, but rather the redirection of students and teachers towards information and communication technology, thus balancing the education of experts on one hand with the demands on the Croatian labour market on the other. This will reduce the number of young experts who cannot find employment. In the same way, by redirecting funds related to science in accordance with national priorities, through better connections between basic, applied and development research, long-term support to the development strategy can begin.

In primary and secondary schools, it is necessary to modernise education curricula and to carry out systematic teacher training in order to enable teachers to competently implement such curricula.

The highest costs will be related to equipping educational, scientific, cultural, and health institutions, the construction of electronic administration and public services, and the digitalisation of cultural, national, educational, health and business activities. To rationalise the expenses we should initiate the creation of general solutions that could satisfy the needs of different institutions and services.

A large number of jobs related to the development of electronic administration and the digitalisation of different contents can and should be solved through the engagement of professional companies, which have to follow given organisational and technical standards.

This would prevent the undue growth of state administration and stimulate competition, resulting in reduced operating costs.

The Republic of Croatia should co-ordinate its legislation with the legislation of developed countries, because efficient implementation of information and communication technology is based on appropriate legislation and regulations. This is a long-term undertaking which can be carried out by high quality and efficient state administration of the present size.

What is the strategic approach?

The prerequisite for the successful implementation of the strategy is the establishment of four mechanisms: the action plan for the realisation of the strategy aims, the management of strategy implementation, strategy promotion, and control of the implementation of the planned actions and strategic objectives.

The action plan for the realisation of the strategy aims will be based on recommendations and actions that are part of this strategy. These recommendations and actions should be organised into feasible plans that include the precise systematisation of activities, obligations, timelines, and necessary resources.

The National Council for the Information Society Technology, an expert body led by the Prime Minister, will be in charge of the management of strategy implementation. This will ensure the co-operation of experts and politicians necessary for the successful implementation of the strategy. The resources of the Government Strategic Planning Office and the Government Office for the Internet Infrastructure Development will be used for the implementation of the strategy.

Strategy promotion is necessary in order to ensure its acceptance by citizens and companies. The promotion should inform citizens and companies about the possibilities of information and communication technology in order to gain their active support in creating an information society, but also to point out the obstacles to the achievement of these goals.

The Parliamentary Committee for the Information Society Technology will control the implementation of the planned actions and strategic objectives on behalf of citizens. This control will prevent misuse of the state budget and possible abuse of the information and communication infrastructure.

What are the benefits for citizens?

The realisation of the strategy aims will be of benefit to citizens. Unemployment and the emigration of young educated people will be reduced. Opportunities for high quality education, lifelong learning, and distance learning will be available on the Internet. Public information and services will be easily accessible. Accordingly, the state administration will be more efficient and will have control over expenditure that could improve or rationalise the state budget.

Home banking, everyday purchases, opportunities to communicate via the Internet will make information and services more easily available without having to leave home. This system of information will be available in public institutions, schools, hospitals, libraries and local communities.

Youth and education

A major part of this strategy, recommendations and activity is dedicated to the young generation of Croatians. Primary and secondary school education should include information and communication technology that will enable young people to understand the basis of this technology. Having such skills will help them to work with technology and make them more competitive on the labour market. The creation of a more thorough general education with the greater independence and adaptability of students in the educational process and the fostering of critical and analytical thinking will contribute to the same objective. This kind of education will facilitate independent and lifelong learning for young people and enable them to adapt more easily to changing jobs, something which will happen more often in the future.

University graduates will be capable of using information and communication technology in their branch of business. They will develop a good understanding of these technologies and will be able to use newly developed applications. Finally, the number of highly educated young people specialised in information and communication technology will increase. These people will play a major role in the future research, development and improvement of this technology in Croatia.

Older people and people with special needs

This strategy does not forget older people for whom information and communication technology enables the creative use of free time and participation in public life, in terms of: access to more reliable information, easier communication, and the opportunity to participate in public debates and to use their knowledge and experience in an advisory capacity. Information and communication technology offers the possibility of employment and education to a large number of people with special needs, as well as other social activities that could improve their quality of life.

Risks and how to overcome them

Information and communication technology, along with the obvious benefits, also brings a number of risks, for example, invasion of privacy, Cybercrime, the spreading of materials with illegal and offensive contents, and an increase in the gap between the educated and wealthy on one hand, and the less educated and poor on the other hand. In order to minimise any potential damage and difficulties, citizens should be informed about the potential dangers and the kinds of problems they may encounter, as well as ways to deal with such problems.

What should the Government do?

The Government is expected to be firm in strategy implementation and in this way lead Croatia towards accelerated growth. It is important to implement an efficient rule of law, a stable macroeconomic policy, a tax policy that will stimulate investments and entrepreneurship, the development of financial markets and the reform of the labour market. It is equally important to carry out a thorough reform of state administration and the education of employees with the aim of creating an efficient, entrepreneurial public administration.

In the information and communication technology sector, the Government should urgently deregulate the telecommunications market, develop the information and communication infrastructure in the whole country and stimulate the development of e-business and e-administration. The Government should also stimulate its own production, research and development and applications in the information and communication sector, harmonise

Croatian legislation with the legislation of developed countries and adopt international standards related to this sector.

With education as the basis for economic development and the future information society, it is very important for the Government to focus on creating a modern and efficient education system, which at all levels includes information and communication technology. Stimulation of scientific work in the sector of information and communication technology, and the co-operation of scientific and research institutions with production and service companies is necessary in order to create the conditions for the development of innovative products and services which are competitive in the international market.

The Government should encourage promotional activities to inform citizens and companies about the possibilities of the information society, and mobilise them to participate in activities necessary for its establishment. As well as through public media, the promotional activities should be organised at all levels of educational institutions. It is also necessary to organise coverage of the progress of the information society in Croatia using statistical parameters, and carry out periodical benchmarking with the progress of transitional and developed countries.

What are the benefits and obligations for companies and entrepreneurs?

The implementation of measures such as those to assist in the simpler and less expensive establishment of new companies, measures for attracting foreign capital and increasing the rate of the education of information and communication technology experts will enable a more dynamic establishment of technologically advanced companies and lead to the revitalisation of economic activities. Measures for the promotion of e-business and appropriate legislation will enable companies to adapt to e-business and enter the global market more quickly. Support to small and medium-sized enterprises in the production of high quality products and services based on information and communication technology will facilitate their involvement in the creation of value of large international companies.

State administration will engage companies who satisfy certain quality standards of products and will encourage the competitiveness of small and medium-sized enterprises. There will also be a shift in state administration to e-procurement, which will make state administration

operations more transparent and ensure jobs for companies with high productivity and which offer high quality products and services.

In order to be able to offer the increasingly complex and competitive products needed in the value chain of large international companies, domestic companies will have to forge links with other companies in development units. The organisational connection between research and product development will accelerate the company innovation cycle and facilitate the acceptance of information and communication technology.

The development of innovation in the use of modern technology requires the education of the experts and managers already employed. For this purpose, companies will need to invest in education, set demands to educational institutions for the creation of appropriate education programmes, and allow employees to study using the Internet.

What are the benefits to society?

Education through information and communication technology will improve the efficiency of education, while education in information and communication technology will create the experts needed for the latest work processes which in turn will attract foreign and domestic investors.

The creation of an integrated national health informational infrastructure will give citizens easier access to health information, while doctors and medical personnel will be able to monitor their patients' condition and offer medical services to patients in outlying and distant regions. Such a health system should provide better health protection and care and result in an overall decrease in the costs of healthcare and in the number of cases of sick leave.

Cultural content, which is an important part of national identity, will be gradually digitalised and through electronic catalogues will be available to the general public, schoolchildren, students, cultural workers and scientists. In this way, cultural information will be available to interested parties in more isolated locations, and Croatian culture will be more easily promoted abroad. In addition, it will enable a much swifter search for books from distant locations than was the case previously in traditional libraries.

In local communities and suburbs, Internet centres with free access to the information and communication infrastructure will be established, which will provide universal access to public

services on the Internet. This will help restrain an increase in social differences. Such Internet centres are very important in rural, less populated, isolated and less developed regions where they could help in the creation of jobs, obtaining medical help and advice, and in increasing the general level of education in information and communication technology.

Finally, access to relevant information is good for citizens' awareness of important social issues and for the development of democracy.

What are the tasks of experts and scientists?

Experts and scientists from the information and communication technology sector need to design an education system related to their field: from primary and secondary schools to universities through to a system of postgraduate specialisation and lifelong learning. Universities should develop education systems and programmes for professional engagement in information and communication technology.

Scientists should initiate fundamental and applied research in the information and communication fields, participating in interdisciplinary research on the social and economic consequences of this technology, and promoting international co-operation. One very important issue for the development of society is open and bilateral scientific co-operation between universities and businesses on research and development projects and programmes. Interdisciplinary co-operation between experts and researchers in the sector of information and communication technology on one hand and experts and researchers from other fields that use this technology on the other hand could bring new solutions, which would also be of interest in the international market.

Recommendations and Action Plan Related to Information and Communication Technology

Recommendations are classified into seven groups whose headings match the headings of the paragraphs where the recommendations are further explained. The introduction of each group serves as a summary of the paragraphs in which the recommendations are discussed. For a full understanding of the recommendations and action plan, it is necessary to consider the whole document in detail.

Information and communication technology and the information society

Information and communication technology is without doubt the overarching generic technology of today. Its impact on human development will be more significant than the impact of all previous technology. Today's use of computers and networks is only the opening phase of the information and communication technology era.

In the Republic of Croatia, conditions should be created to extend research, development, production and all forms of use of information and communication technology needed to connect with developed countries. This technology could have a significant influence on the overall progress of society and serve as a basis for resolving many critical issues. The use of information and communication technology assists in the development of the information society and knowledge society in which knowledge becomes the main factor of production.

Recommendation 1: National Council and Parliamentary Committee for the Information Society Technology

In discussing the strategic role of information and communication technology in the coming period, future technological changes should be considered. The Republic of Croatia must join the circle of countries that actively participate in the development of information and communication technology.

Activity

Implementations Begins

Establishment of the National Council for the Information Society 2001

Technology led by the Prime Minister, which will stimulate the strategy issues in order to achieve overall benefits for society through the use of information and communication technology, and will co-ordinate the activities for the achievement of those issues.

Establishment of the Parliamentary Committee for the Information Society Technology which will permanently keep abreast of development and direct the use of information and communication technology.

Information and communication infrastructure

The Republic of Croatia can and must build the information and communication infrastructure on general technical and market principles in order to provide its citizens with access to, and to enable participation in, the information society, thus offering new opportunities in life, employment, learning and creativity, in the new economy during the transition from the industrial to the information society.

Development should be directed towards a multi-service network with a group of services matching the needs of citizens and the economy, including broadband access and mobile Internet access, the new generation Internet and the general mobile telecommunications system. In the shortest possible period a liberal telecommunications market harmonised with the European model should be established, for which product components and services will be researched, developed and produced in the country.

Recommendation 2: Inexpensive, fast and safe information and communication infrastructure

The construction of an inexpensive, fast and safe infrastructure through the creation of the information and telecommunications market, competitive in the provision of all services, with direct influence on the application of new technologies and the implementation of new services with telecommunications operators and service providers, the stimulation of research, development and production of information and communication equipment and services, and through the operations of existing and new companies in the high-technology sector.

Activity**Implementations Begins**

Direction and supervision of investments in the development of the information and communication infrastructure towards a multi-service network with a set of services capable of meeting the needs of the economy and citizens, including broadband Internet access and access to the mobile Internet, the new generation Internet and the general mobile telecommunications system. Attention should be given to procurement conditions for equipment for operators and service providers, completely or partially owned by the state or state institutions.

Preparation of implementation of general mobile telecommunications system UMTS in 2002, in compliance with the dynamics of the European Union. Increase in number of mobile network operators through the issuing of three licenses for UMTS on the national level.

Implementation of broadband access on a national level supporting advanced services and applications, especially in companies and operations with international activities.

Realisation of international connections with appropriate capacity and quality for voice communication and Internet needs with all business centres around the world with which we already co-operate or seek to co-operate, as well as with countries from which we achieve the greatest tourism revenue.

Start activities for the construction of an e-business infrastructure, which should ensure the basic e-business functions: registration and certification, public e-mail and electronic exchange of documents.

Diffusion of the Internet, increase in spread of basic services, with support from the public network and Internet service providers, implementation of advanced services in co-operation with the Croatian academic and research network (CARNet) as a promoter of the new Internet generation. Acceptance of priority measures from the eEurope

2002 action plan for cheaper and faster access to the Internet:

1. Introduction of full competition in telecommunications, including local loop,
2. Reduction of prices for Internet access and decrease in tariffs for leased cables resulting from increased competition,
3. Introduction of IPv6,
4. Assignment of frequencies for multimedia wireless systems.

Connection to the European activities for safe infrastructure and 2001 acceptance of priority measures from the eEurope 2002 action plan:

1. Increase in availability of safe transmission technologies and products with IPsec and IPv6 and protection of privacy,
2. Introduction of a smart card,
3. Coordinated approach to the prevention of Cybercrime.

Recommendation 3: Liberalisation of the telecommunications market

Establishment of liberal telecommunications market in compliance with the European model in shortest possible period.

Activity

Prepare a Report on Telecommunications Regulations in the Republic of Croatia with the following contents: an independent national regulatory body, a licensing system, connection and network access, local competitions, cable leasing, the Internet, general service and user protection, a tariff policy and cost assessment, addressing and numeration, data protection, the rights of data transit, and frequency spectrum planning and management. A suggestion for changes in Croatian legislation in compliance with the regulation package of the European community should be included in the report. The report on telecommunications

Implementations Begins

Immediately

regulations should be prepared on an annual basis.

Determine the border between ownership and concession in the information and communication infrastructure. Concessions granted to operators and service providers should be subject to investments in the development of the information and communication infrastructure in compliance with world trends, and with special incentives to our own research and development in the Republic of Croatia. Immediately

Establish measures for the creation of an open information and telecommunications market that will be competitive in the international market, stimulating investment and employment, and for which product components will be researched, developed and produced in the Republic of Croatia. Different commercial roles in the market that are connected with products, services, server systems and networks will be realised on principles of objectivity, transparency and non-discrimination. 2001

Establishment of measures to: 2001

- gain both responsibility and influence for Croatian science and the profession to exert on the development of information and communication infrastructure and the partnership of the public and private sectors,
- protect the interests of the Republic of Croatia with the same mechanisms by which the European Community protects its interests in the world,
- make all information and communication traffic with its origin and destination in Croatia subject to Croatian legislation,
- establish supervision and control of the information and communication operations based on European Community principles.

Recommendation 4: Access and participation of citizens in the information society

Enable all citizens to access and participate in the information society by developing the information and communication infrastructure throughout the country, with care for young people, people with special needs, the older population and poor people.

Activity

Implementations Begins

Free connection and use of the Internet for all education institutions, with the aim of providing students with access to multimedia services in class. The initial solutions should be based on access to the Internet through the telephone or ISDN network. 2001

Apply the obligation to provide general service and enable citizens to access basic public information: legal and administration information, culture, environment and traffic conditions, and gradually electronic access to public services and education institutions. 2001

Enable access to information services from public points of access in schools, libraries and local community headquarters, which is especially important for the young and those who have no other access to the Internet.

Examine special tariff schemes for citizens with low incomes.

Abolish duties and introduce benefits, thus affecting the price of information and communication equipment and software, especially for educational and personal use.

Stimulate, in compliance with the eEurope initiative, the application of “design for everyone” principle for information and communication technology products and services. Take care of people with special needs in the purchase of information and communication products and services. 2001

Integrate less developed regions through general services principles 2002

and financial instruments to support the development of the information and communication infrastructure and free access to the Internet in public places. Special solutions are needed for less populated islands with high seasonal variances of information traffic.

E-business, e-administration and transformation of other activities

The information and communication infrastructure, especially e-business, should greatly aid in the development of the Republic of Croatia; it will enable the transition into an information society, increase employment, keep young experts in the country and increase the competitiveness of companies.

The creation of e-administration should enable the provision of fast and high quality services to citizens and companies and ensure the rational use of the state budget. The information and communication infrastructure provides new and flexible ways of working, gives access to cultural and national information in an electronic format, and makes available health information and services to citizens and health professionals.

Recommendation 5: e-business

E-business represents the basis for the achievement of companies' competitiveness, it enables their presence on the global market, as well as the establishment of new companies and new employment possibilities. Therefore, its development should be intensively encouraged. The basis for the successful development of an information society is to draw up Croatian legislation in the areas of information and communication technology and establish a legal framework for e-business that will encourage its use and ensure its stability and predictability. When introducing laws and subordinate legislation, wherever possible, international legislation must be accepted and applied.

Activity

Determination of the main goals and priorities in e-business with periodical analysis of flow of activities. Establish partnership

Implementations Begins

Immediately

between the Government, business entities and the academic community.

In co-operation with professional communities, an overview of 2001 legislation related to information and communication technology in developed countries and a review of the required Croatian legislation should be carried out.

Introduction of Legal Acts regarding e-business, including solutions for the protection of privacy, availability of public data, data protection and the prevention of Cybercrime. Introduction of standards for the protection of personal information and ban on misuse of personal data. Introduction of Legal Acts on e-signature and e-money and the creation of certification institutions.

Ensure participation of the Republic of Croatia in international 2001 forums and discussions on key issues and propose solutions, laws and subordinate legislation regarding e-business. Establish mutual co-operation between our international representatives to represent established state policy and report on its implementation.

Bring measures to attract investment capital directed towards the 2001 foundation and accelerated growth of small and medium sized enterprises that operate exclusively on the Internet. The fast and inexpensive registration of new companies, tax exemptions in the initial period of business and tax relief for the employment of new employees.

Encourage mutual confidence in e-business through the partnership 2001 of consumer representatives and industry. Encourage the out-of-court settlement of disputes.

Implementation of a free information service with practical 2002 information on e-business for small and medium sized enterprises, with examples from best practice, information on different markets,

investment and microeconomics analyses and advice on corporate management. Offer information about ways of gaining new knowledge and skills in e-business and enable the creation of a virtual community for mutual help in solving problems.

Recommendation 6: E-Government

E-government enables the increase both in the quality and efficiency of national and local government services, providing high quality information to both citizens and companies and more efficient and transparent business transactions with firms. Therefore, it should be developed as soon as possible. The Government must appear as an exemplary user of e-business, which will thus encourage the entire public sector, business entities and citizens to use e-business. Most of the jobs regarding the introduction of e-business in national and local government should be entrusted to professional companies.

Activity

Setting the main directions of work and priorities in the area of e-government, with periodical analyses of the course of activities. To establish a partnership between the Government, business subjects and the academic community.

The creation of the conceptual model of the national information system and fundamental prerequisites for the development of e-government: the networking of the bodies of central and local government, an e-mail system, an electronic information exchange system with open access, and the creation and exchange of electronic documents. The analysis of the existing solutions, in particular databases, and possibilities for their integration and unification of usage. Through specific legal regulations, the use of all non-classified information should be made available to citizens and companies.

Implementations Begins

Immediately

The services of national government and local self-government should be equipped and provided with support in the area of information and communication technology.

The adoption of the regulations on office administration with the 2001 rulebook for electronic documents and electronic signature, the unique registration of public electronic keys within national and local government, exchange of electronic information and a unified system of electronic document management.

The establishment of organisational and technical standards, which 2001 will secure compatibility and ability for teamwork and the achievement of high business and technical standards, together with most of the contracts regarding the development of e-government, should be entrusted to professional firms. This would prevent the growth of national and local government and at the same time encourage competitiveness, which will lead to a reduction in labour costs.

The establishment and adoption of the European system for 2001 certificates of competence in computer skills – ECDL (European Computer Driving License) as the fundamental criterion of employee proficiency in national and local government. Defining a way of introducing ECDL into proficiency testing of employees in central and local government. Encouraging the adoption of the same method for certifying proficiency in all public offices and even in the private sector.

The transition of national and local government to e-business and 2002 the development of major e-management applications in the key areas of national and local government. Priority should be given to

electronic procurement because of the extremely large impact on the overall development of e-business, both in the private and public sector, and to transparency of business transactions.

Introduction of simplified electronic administrative procedures for business procedures, e.g. for rapid registration of firms. 2001

Encouraging the use of modern methods of reengineering business processes and systems for decision-making support in national government. 2001

The development of accessible, high quality information services for citizens and companies, which would also include the creation of a unified Web "window" for information and services access at all levels of national and local government. The priority contents would be selected in accordance with the eEurope 2002 action plan. 2002

The introduction of the reengineering of business processes and modern methods of decision-making support based on information and communication technology in higher education for positions with national government. 2002

Recommendation 7: Teleworking

Teleworking has great potential because it allows for the reduction of company expenses and at the same time improves the employee's quality of life. Thus, there is a need for its gradual introduction.

Activity	Implementations Begins
Legal regulation of teleworking practice.	2001
Seminars on teleworking skill acquisition and organisation.	2001
Incentives for teleworking through tax benefits	2002
The Government itself becomes a telework user for various kinds of	2002

tasks where physical presence is not necessary. The transition towards this working practice should be encouraged through the subsidising of computer procurement and telecommunication costs.

Information and Communication Technology as a Production Sector

Information and communication technology is the dominant state-of-the-art technology today. The convergence – or the tendency towards integration – of the telecommunications, computer and media sectors is not an option but a necessity, which leads to the formation of a new value chain in information and communication technology, with changes in the distribution chain of total revenues.

Only domestic production and domestic research and development in the area of information and communication technology can secure the needed critical mass of knowledge for comprehensive development. It is through the application of the three-layered innovation model and the model of a successful information and communication firm that the Croatian economy will have a good chance for progress.

Recommendation 8: Development of Information and Communication Technology as a Production Sector

The Republic of Croatia should promote, encourage and, through its own institutions, accelerate the presence of – and, if none is present, initiate the creation of – new technologies, and particularly those in the area of information and communication technology as a production sector. In the same way, the convergence of the telecommunications, computer and media sectors in their industrial areas should be accelerated, the value chain of the information and communication technology should be asserted and measures should be taken for its balanced and rapid development.

Activity

Implementations Begins

Establishing development priorities concerning 21st century Immediately

technologies, primarily information and communication technology as a production sector together with some traditional technologies. The development priorities should be decided on based on the following criteria: the prospects of the technology, market size, infrastructure characteristics and known preconditions.

In state institutions and state-owned companies, giving the advantage to competitive Croatian products or products with functionality added by Croatian companies, in order to strengthen the position of Croatian companies. Without references in the domestic market, there is no proof of the market value of the products and services of information and communication technology, which are crucial for export to the world market. Immediately

Attracting to the Republic of Croatia significant world manufacturers in the information and communication technology sector which have development programmes and which are not solely involved in distribution, in accordance with the value chain. Foreign investments in prioritised areas should be conditioned by the elimination of intermediaries between the mother company and the Croatian firm. Immediately

Basing public tenders for work in information and communication technology in the state sector on the principle of the convergence of telecommunications, computers and media. Tax benefits should be introduced for all work based on public tenders issued by the state which results in the acceptance of convergent solutions offered by, or with the participation of, Croatian companies. 2001

Allowing the unrestricted circulation of information and communication equipment, with special emphasis on software, by means of taxes that do not exceed those of the European Union. The introduction of customs and other benefits for all institutions and firms for the import of platforms and support which serve to 2001

increase knowledge and domestic development in the information and communication area.

The initiation of the comparative price, quality and functionality 2001 valuation of all forms of the information and communication sector, and particularly of those in the area of services and applications and the multi-service network. Publishing a list and making awards to the best institutions and firms in the Republic of Croatia, and comparing them with those in developed countries.

Recommendation 9: Focusing on Software and Innovation

Of its prioritised development directions in the economy, the Republic of Croatia should put information and communication technology in first place, with the accent on software and with an orientation towards network applications, services and protocols. Software demonstrates the knowledge built in the systems, and such highly valuable intellectual and ecologically sound products provide an opportunity for growth in the world market. In the Republic of Croatia, the three-layered model of an innovative organisation, which includes knowledge, know-how and creativity, and the model of the innovative information-communication firm, should be promoted, supported and encouraged in its development.

Activity

Balancing the development of all the elements of the value chain in 2001 the area of information and communication technology, taking into account that priority will be given to the development of services and applications, and the software elements for the multi-service network, as parts of the chain with a higher portion of revenue. Conforming with ISO (International Standard Organisation), CMM (Capability Maturity Model) and other standards for the area of software engineering. Detailing of the corpus of knowledge necessary for software engineering.

Implementations Begins

Tax benefits for all firms in the area of information and communication technology that provide a quality programme for the permanent education of their employees 2001

The preparation for, and free education about, the model of the innovative firm for all firms which are completely or partially owned by the state. This education, either through the payment of fees or by invitation, would be open to other firms as well. 2001

The development of technology parks and enterprise incubators, taking into account the experience of successful foreign models. 2001

The creation of the conditions for, and acknowledging, supporting and promoting innovative solutions and their authors. Establishing the criteria for efficiency and innovation (ideas, patents, products) of the research and development units in the information and communication sector. The introduction of comparative evaluation, the recognition and rewarding of the best ideas, patents and products, and marketing support for new Croatian products. 2001

Securing incentives, conditioned by the results achieved in the formation of domestic research and development. Introducing an annual tax return for every increase in the research and development potential in information and communication technology as a production sector. 2001

Recommendation 10: Open Opportunities for Accelerated Growth

University units that produce top experts, and large and many smaller firms that encourage the innovation, abstract thought and imagination necessary for software products and services are the forces behind Croatian information and communication technology. The increased needs of Central and Eastern Europe for this kind of technology, together with the global lack of experts in the sector, should, provided there is rapid action, provide the Republic of Croatia with the opportunity to develop and increase employment. Therefore, the Republic of Croatia

needs to create conditions to double revenue and the number of employees every three years and to triple exports in the area of information and communication technology as a production sector.

Activity	Implementations Begins
Education reform, at university level in particular, in order to provide the necessary number of experts and managers capable of working in information and communication technology as a production sector.	2001
To increase by one thousand every year until 2005 the number of expert graduates in the area of information and communication technology for positions in research, development and production, with further continuous growth, together with the creation of managers in this area.	2001
To start at least one major and, for the Republic of Croatia, important development project in the area of information and communication technology at each ministry or state institution. The implementation of the project would be assigned to economic subjects with a research and development department in the Republic of Croatia. The assignation of the project would be conditioned by co-operation with universities or independent scientific research institutes.	2001
To initiate at least one research project in the area of information and communication technology per ministry or state institution. The project realisation would be assigned to the universities or independent scientific research institutes, on condition that co-operation is established with the business sector.	2001
The co-ordination of Croatian companies in the area of information and communication technology for aggressive joint performance on	2001

the markets of Central and Eastern Europe. The efficiency of this activity should be measured by increases in exports.

Information and Communication Technology in Production and Business Processes

An increase in productivity in all economy sectors can be accomplished by the appropriate application of information and communication technology. Through interdisciplinary co-operation with experts in information and communication technology, some of these applications might contain the beginning of new or innovative products and services, which may also be competitive in global terms. In the Republic of Croatia, a climate must be created to encourage innovation, and, specifically, to support research and innovative activities based on the application of information and communication technology in various areas. The products and services created on this basis might also be commercially attractive to developed countries, since so far there are simply not enough experts in the world capable of using all the potentials of information and communication technology.

Recommendation 11: Improvement of Production and Business Processes

Advances in complex industrial information systems need to be pursued in a systematic way. The objective of this activity would be to take into consideration the latest trends in the building of complex industrial information systems when constructing and modernising industrial installations. There is also a need to promote greater use of methods of reengineering business processes and decision-making support systems in complex business systems.

Activity:

Implementation Begins

Encouraging systematic pursuit and promotion of the latest 2001 achievements in the area of industrial information systems.

Ensuring that relevant Croatian institutions actively participate in the 2001 work of international consortiums actively working on the creation of the standards in their respected areas.

Encouraging the use of modern methods for the reengineering of 2001

business processes and systems for decision-making support in complex business systems.

Introducing the reengineering of business processes and modern 2001 methods of decision-making support based on information and communication technology in the higher education of managers.

Building a system and network of knowledge management. At a 2002 national level, devising a rational way of accessing technological databases and knowledge bases about production procedures and the organisation of procurement, financing and dissemination of information on a national level.

Education and Scientific Research

Education and scientific research are the foundations of the information society, that is, of the knowledge society. This claim also refers to education in relation to information and communication technology. Elementary and high school education must allow for young people to grasp concepts that are invariant on the current state of technology, in order to facilitate the acquisition of skills and knowledge needed for the use of newly created technological phenomena. The education system must arouse the interest of students in independent study and equip them for lifelong learning.

In higher education, there is a need to provide a choice of subjects and models of undergraduate programmes from the area of information and communication technology, adapted to specific university groups. It would be appropriate to organise information and communication technology education throughout life in the form of interdisciplinary specialisation courses. In the knowledge society, science must, from the existing and newly formed fund of knowledge, select, form and transfer to the general public much more than before the kind of knowledge that it considers essential for progress to be made. Without your own science, there is no good education.

Recommendation 12: School for the Information Age

Information and communication technology will certainly strongly mark the period of the next couple of decades. The education system must equip young people who are currently enrolled in elementary and high schools, as well as those who are about to enter the education system, to live in the information society. Moreover, the education system must face the fact that students must be prepared for lifelong learning, a phenomenon that is becoming a prerequisite of success in the future knowledge society. As such, the education system must become part of the implementation of the concept of lifelong learning.

Activity

Implementation Begins

The construction of the model of the syllabus in the area of information and communication technology for elementary and high schools. Special attention should be given to the educational programmes that develop and stimulate inventiveness from an early age. In both elementary and high school syllabi, there should be the inclusion of attractive promotional activities concerned with the information society.

2001

The organisation and implementation of a system to enable all teachers to acquire skills for the area of information and communication technology. This education should be organised with the help of higher education institutions, experienced schoolteachers, as well as experts from local companies. Such education should take the form of organised lifelong education with an appropriate assessment of the knowledge gained.

2001

The setting of a realistic minimal standard that schools will have to satisfy, facilitating this practice immediately, and adapting it every year. Models of alternate financing should be constructed and programmes to equip schools should be directed towards shared use of the infrastructure with the local community and the shared use of the infrastructure of the business system of schools and

2001

Ministries.

The forming of a plan for the systematic equipping of schools with 2001 computer equipment and the drawing up of detailed plans of financing that will allow the school system to include as much as possible of the latest information and communication technology, but also to make use of the older equipment, which is either already present in the school system or can be received through various donations. The organisation of a good maintenance service and the provision of the financial means needed for equipment maintenance.

Providing opportunities for the organisation of classes for adults in 2002 all schools in the local environment, in co-operation with the private sector and with the participation of the teachers trained in the area of information and communication technology.

Recommendation 13: Information and Communication Technology in Higher Education

For all universities, there should be detailed proposals on basic content in the area of information and communication technology, which should be included in the curricula and syllabi. For those universities that educate students for professional work in the area of information and communication technology, detailed draft proposals of the curricula and syllabi should be made, taking into consideration the specific needs of the economy and society in general.

Activity

Developing guidelines for the inclusion of information and communication technology in the curricula and syllabi for every type of institution of higher education. The guidelines need to contain elements for evaluating parts of the curricula and syllabi that deal with information and communication technology. There is a

Implementation Begins

Immediately

recommendation to include ethics in the syllabi for universities that educate experts in information and communication technology.

An increase in the number of students attending courses in the field of information and communication technology. 2001

A gradual increase in the number of teachers and researchers in the field of information and communication technology. 2001

Recommendation 14: Interdisciplinary Acceptance of Information and Communication Technology

There is a need to establish additional ways for the systematic training of experts in various fields in order to make them proficient in the use of information and communication technology and in the interdisciplinary activity of creating new products and services.

Activity

Implementation Begins

The inclusion in undergraduate studies of contents that will ease the use of information and communication technology for future graduates and at the same time enable them to acquire new knowledge in this area throughout their lives. 2001

The formation of specialist postgraduate courses and other suitable forms of education that can be received throughout life, in which experts from various areas would be able to gain the skills needed for interdisciplinary innovative activity. 2001

The establishment of interdisciplinary postgraduate specialist courses to encourage the application of information and communication technology in various production and service processes and procedures. 2001

Recommendation 15: The Information and Communication Support of Science

The community of scientific researchers needs to have access to broadband connections, as well as to the latest information and communication technology products.

Activity

Implementation Begins

Preparing a plan to equip scientific and scientific and educational institutions with information and communication technology. Linking the Croatian academic and research network (CARNet) with the most advanced European infrastructure of the same sort.

2001

Devising a rational way to create electronic libraries on a national level.

2001

Recommendation 16: Science in Information and Communication Technology

Information and communication technologies are developing so quickly that demands are being placed on research to keep up with this development in the years to come so as to establish continuity with future and approaching technologies. Croatian science can, and should, participate in such fundamental and applied research, at the same time strengthening international co-operation. It is necessary to form large research teams in accordance with national priorities and involve a large number of institutions, which is also a condition for winning European projects. However, science itself is being assigned a very important additional role in the knowledge society. In addition to having to strive for new scientific knowledge, scientists have to use the existing and newly formed fund of science much more overtly than before, to select, structure and pass on to the economy and general public the kind of knowledge that they consider essential for the advancement of mankind.

Activity

Implementation Begins

Initiating a science project called "Research in the field of information and communication technology" to allow the pre-competitive pursuit of the further development of information and

2001

communication technology both globally and domestically, to offer a scientific foundation for the implementation of the strategy, to unify individual research projects in a common strategic concept, to unify research teams using information and communication technology, to introduce more young researchers to research and provide the foundation for the development of competitive services and products of information and communication technologies.

Initiating fundamental research directed towards the new 2001 information and communication infrastructure based on radically new principles of distributed computing and communications in order to make them omnipresent, movable and scalable and also to guarantee the quality of service.

Initiating applied research aimed at the advancement of various 2001 areas of human activities and the creation of knowledge, in particular in the areas of data mining and knowledge discovery, decision-making support and the creation of models and simulations of social, economic, technical and ecological systems.

Encouraging research on the use and application of programmes 2001 from the open source domain in government institutions, education and science, including solutions for the identification of successful products.

Encouraging research on the Croatian language necessary for the 2001 development of the interface with a national content on the information and communication infrastructure.

Encouraging research on the links between information and 2001 communication technology and employment, and the role of education in securing employment.

General Measures for the Development of the Information Society

Recommendation 17: Measures for Encouraging and Observing the Development of Information and Communication Technology

The efficient application and development of information and communication technology is based on clear legislation and regulations, and therefore the Republic of Croatia has to change its laws in accordance with the laws of developed countries. In the same way, it is necessary to modify the existing legal acts related to the protection of intellectual property. An efficient way of adopting the international standards for the area of the information and communication technology has to be established. Since the dynamics of the development and introduction of information and communication technology are critically defined by the quality of experts, there must be support for the activities of the associations of experts who nurture the principles of professionalism, ethics and continuous professional improvement. In the same way, there must be support for promotional activities, and it is necessary to establish ways of benchmarking the progress of the information society in the Republic of Croatia.

Activity

Implementation Begins

The detailing of Croatian legal regulations in the area of information and communication technology, the process by which international regulations should be adopted, or more precisely, applied, whenever possible. 2001

Providing measures for the support of the development of all aspects of intellectual property, especially those measures that have been effective in developed countries, together with the acknowledgement and acceptance of results and successful models already applied domestically. 2001

The establishment of an interactive forum for the expert and general public through the use of the Internet. This forum would discuss the registered applications and acquired rights of industrial property 2001

(patents, goods and service brands, industrial forms) in the Republic of Croatia as well as the trends of the intellectual property doctrine and practice in the world. The creation and promotion of a model to stimulate innovation in the economy and to keep up with its practical application. The development of a proactive approach in innovation stimulation (so-called user development), and the correct financial treatment of the author of the innovation.

The taking over, adoption and application of international standards 2001 in information and communication technology. These standards represent an important issue in harmonisation with the World Trade Organisation and the European Union. Allowing the intensive professional engagement of those individuals and institutions that are involved in taking over and adopting the standards from the area of information and communication technology. Setting deadlines for the completion of the entire task of taking over and adopting the standards for the information and communication technology sector.

The research, development and introduction of technical protection 2001 against illegal and offensive Internet content, education about the dangers of the Internet; introducing citizens to the legal aspects of communication and sharing information through the Internet.

Treating the expert community of information and communication 2001 technology as a partner in the discussion of all questions in both the narrow and the general area of expertise. Developing a legal basis to define the way of organising non-governmental organisations and which also defines information science as a profession, its role, goal and mode of operation. The latter should be done with regard to the fact that the expert community should be organised in accordance with the principles proposed and accepted by the European Union. On a national level, acting in recognition of the importance of ethical

principles in the information science profession and supporting further work on information science ethics.

Public support for the development of the information society: 2001

1. active meetings of high state officials with top Croatian experts who live and work abroad,
2. participation of high state officials in events related to information and communication technology,
3. promotion of success and awards given for innovation to Croatian authors and enterprises (for example, public media presentations) and presenting high level honours as awards (for example, decorations),
4. encouraging public media that are state-owned or in mixed ownership to create a programme of systematic promotion of the information society,
5. helping non-governmental organisations which work directly or indirectly on the promotion of the information society (for example, the preparation and participation of young information science students in domestic and international contests),
6. encouragement through tax benefits of sponsorships and donations related to the development and promotion of information and communication technology.

Systematic introduction of indicators for benchmarking the progress of the information society: 2001

1. Making a national map to benchmark the usage of information and communication technology, especially the Internet (with measurements to be taken twice a year). Understanding the distribution patterns based on the relevant parameters (regional, social, age group, education level, income level, and others), and allow comparisons to be made with other countries of interest. The information obtained would be used for detailing the measures that would prevent the creation of a social gap due to unequal opportunities of access to the information and communication infrastructure.
2. Monitoring the indicators of progress of the information society in Croatia and its comparison with the developed and transitional countries.
3. Systematic monitoring of the relevant comparative analyses

and studies in the area of information and communication technology worldwide.