UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

TOWARDS A KNOWLEDGE-BASED ECONOMY

LATVIA

COUNTRY READINESS ASSESSMENT REPORT

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FOREWORD

The last decades of the 20th century have represented a turning point in the global development process. It is knowledge that has become the engine of the social, economic and cultural development in the today's world. Knowledge-intensive economic activities are now a factor of production of strategic importance in the leading countries. They have also become the main indicator of the level of development and the readiness of every country for a further economic and cultural growth in the 21st century. Taking into consideration all these factors, the United Nations Economic Commission for Europe has launched an initiative of monitoring and analyzing the development of the knowledge-based economy in all the European countries in transition and emerging market economies.

The major goal of this initiative is to stimulate the exchange of national experiences, to identify best practices and to promote region-wide and global-wide cooperation of the UNECE member States, which would accelerate the development of a knowledge-based economy in the countries in transition and emerging market economies. It envisages the preparation of country assessment reports on the biennium basis by national experts, nominated by the Governments, the creation of a High-Level Task Force on the Knowledge-Based Economy, which will consider the reports and provide policy advice and recommendations to the participating countries, and the development of progress measurements and indicators, policy guidelines and tools to assist countries in overcoming obstacles to the development of a knowledge-based economy.

We hope that the country assessment reports, showing a detailed level of the countries' potential and providing information on various approaches and solutions, will help policy-makers to take strategic decisions with regards to the challenges facing them in the development of institutions, information and innovation systems, human resources development and other areas crucial for the development of a knowledge-based economy.

Brigita Schmőgnerová
Executive Secretary
United Nations Economic Commission for Europe

Latvia is relatively small country with limited natural resources, thus human resources and knowledge are the main factors that can ensure a long-term development of our country. The specific situation in the country and the global trends both determine the necessity to develop a national economy that is based on knowledge and modern technologies rather than on cheap labor or natural resources.

In Latvia, the development of a knowledge-based economy has been pronounced as one of the key Government priorities by Long-term Economic Strategy of Latvia, and a set of coordinated activities are being implemented to foster the process. The development of knowledge-based sectors of the national economy, the use of advanced ICT technologies and education are the main prerequisites for a stable and dynamic growth of the Latvian economy and the creation of welfare.

ICTs have a special role in ensuring a stable and balanced development of the national economy, as it is one of the elements forming a basis for an environment favorable to innovation and educated society. As it is reflected further in the report, the usage and penetration of ICTs is growing rapidly in Latvia.

We believe that the initiative of the United Nations Economic Commission for Europe to assess the development of a knowledge-based economy in various countries can serve as a valuable tool for exchanging information and best practice among different countries to speed up the introduction of a knowledge-based economy.

Best regards,

Andris Liepiņš
Deputy State Secretary
Ministry of Economy of the Republic of Latvia

PREFACE

The industrial revolution of the 19th century and the scientific revolution of the 20th century have prepared the conditions for the rise of the knowledge-based economy. Economic activities associated with the production and utilization of information and knowledge have become an engine of economic growth in the developed market economies, increasingly transforming all the other dimensions of development and the entire societal ***modus vivendi*** and ***modus operanti*** of the humanity.

What do we mean by "the knowledge-based economy"?

It is not just the digital economy, which incorporates the production and use of computers and telecommunication equipment. It is not quite the networked economy, which incorporates the telecommunication and networking growth during the last decades and its impact on human progress.

The knowledge-based economy is a much complex and broader phenomenon. There are different dimensions and aspects of the knowledge-based economy:

1. The knowledge-based economy has a very powerful technological driving force – a rapid growth of information and telecommunication technologies (ICT). Every three – four year there appears a new generation of ICT. Today, the ICT companies are among the largest corporations. The ICT sector is among the fastest growing economic sectors.

2. Telecommunication and networking, stimulated by a rapid growth of ICTs, have penetrated all the spheres of human activity, forcing them to work into an absolutely new mode and creating new spheres. The information society has become a reality.

3. Knowledge, based on information and supported by cultural and spiritual values, has become an independent force and the most decisive factor of social, economic, technological and cultural transformation.

4. The knowledge-based economy has allowed a quick integration of the enormous intellectual resources of economies in transition into the European intellectual pool, stimulating the development of the former countries. Every country can benefit from developing a knowledge-based economy to become a more equal participant in the global development process.

5. The emerging knowledge-based economy has been affecting other areas of societal activity in every country, including institutional and innovation system, human resources development and etc. and visa versa. The knowledge-based economy has become an engine of progress in every country. If a country is developed, it has a developed knowledge-based economy, if a country is lagging behind, a knowledge-based economy constitutes just a small fraction of its economy.

The report below was prepared by a national expert, nominated by the Government, and represents an overview of the present situation and an assessment of the emerging trends in all the major areas, constituting the foundation of the knowledge-based economy, such as policy and policy instruments, institutional regime, ICT infrastructure, information system, national innovation capacities and capabilities.

Contents

Introduction

Latvia is undertaking a coordinated process to promote the knowledge-based development of its national economy, governance, education, and social policy in order to bring its competitive advantages to the fore. Latvia's approach to knowledge-based development is to facilitate innovative principles across critical spheres of activity, and within key professions and fields of employment. Latvia has an excellent basis for further knowledge-based development as it enjoys one of the highest adult literacy rates in the world.

The State is supporting creative processes with particular emphasis on projects in priority areas of the country's development. The integration of commercial activities into the Internet environment will boost the competitiveness of the Latvian economy in the global market and will foster a larger highly-skilled jobs pool.

In order for Latvia to be successful in its endeavour all actors across society and the country must be provided with the opportunity to participate in the innovative processes which foster a knowledge-based approach to development. A range of activities to broaden access to the Internet; improve the general educational level; and allow a free flow of information are already being undertaken.

Some of Latvia's major accomplishments on the path to an information society and knowledge-based economy include:

- the design of computerised methodological materials and textbooks; the training of teachers to use them; the wide use of advanced information technologies for learning physics, chemistry, mathematics, history, languages etc. in primary and secondary education; the introduction of the *European Computer Driving Licence* in school curricula;
- the development of a logically unified information processing mega-system with a common data field and unified user's interface to integrate all public information systems, and to ensure their interoperability. The mega-system is being interconnected with a national portal, thus, ensuring a real base for the development of all e-governance functions too; full compliance with today's basic principles of the IDA Programme, allowing for the integration of Latvia's information systems into Transeuropean telematic networks.

Several basic weaknesses hinder these developmental processes:

- the contribution of universities toward the achieving national priorities is insufficient; the share of programmes in life sciences, technologies, and mathematics is too small for knowledge-based development; the training of specialists with higher qualifications (Master's and Doctor's degrees) in priority fields should be expanded and improved;
- regional development across Latvia is not balanced, and significant socio-economic differences exist between various parts of the country; the economy in rural areas is not sufficiently diversified with agriculture dominating; the development of a knowledge-based economy in the provinces has not really begun.

Only the implementation o f truly innovative approaches; the revision and restructuring of traditional procedures; the expansion of opportunities for all individuals; and the exploitation in full measure of the opportunities that are provided by increased knowledge potential, will ensure maximum social and cost-benefit effects.

A great deal has been accomplished since the restoration of Latvia's independence in 1990, including: the re-establishment of a democratic system in the country; the development of a functioning liberal and open market; and a number of steps in the process leading to Latvia's integration into international organisations.

The Latvian economy has grown steadily in recent years. GDP, between 1996 and 2001, grew by 35.4%, or by 5.2% a year on average. The GDP of Latvia in this period increased approximately twice as fast as that of any EU member state, and one and one half times faster than that of the EU candidate country. The reforms carried out in the last decade have started to yield results. There is still a great deal to be done, however, to reach the level of wellbeing of western European counties. According to the data of EUROSTAT, GDP per capita in purchasing power parity in Latvia in 2000 equalled 30% of the EU average (26% in 1996).

The economic growth of Latvia in the last two years has been among the fastest in Europe. In 2000, GDP went up by 6.8% and in 2001 by 7.7%. Considering the slowdown of the global economy in 2001, with the US, Japan and the European Union either in, or close to, recession, Latvia's economic achievement is a considerable one.

Table 1. Key Indicators of Economic Development

	1997	**1998**	**1999**	**2000**	**2001**
	growth rates in percent				
GDP	8.6	3.9	1.1	6.8	7.7
Private consumption	5.0	6.2	5.1	5.6	7.0
Public consumption	0.3	6.1	0.0	-1.9	1.8
Total fixed capital formation	20.7	44.0	-4.0	20.0	11.6
Consumer prices	8.4	4.7	2.4	2.6	2.5
	percentage of GDP, unless indicated otherwise				
General government budget fiscal balance (less privatisation revenues)	0.6	-0.9	-4.2	-2.8	-2.1
Central government debt	12.0	10.4	13.1	13.1	15.0
Foreign direct investment (flows)	9.3	5.8	5.2	5.7	2.7
Registered unemployment rate (%, end of period)	7.0	9.2	9.1	7.8	7.7
Exchange rate of LVL against SDR (end of period)	0.7997	0.7997	0.7997	0.7997	0.7997

Source: Ministry of Economics, 2002

The global knowledge revolution and the heightened possibilities for rapid processing of information have offered unprecedented opportunities for the improvement of living

standards in Latvia. Information and knowledge are rapidly becoming the driving forces of development in all spheres of life. The significance of raw materials and energy resources, as well as the other components of physical capital, is not decreasing, but thanks to knowledge their exploitation is becoming more rational.

1. National strategy and action plan

Development of a knowledge-based economy has been deemed a key priority of the country's overall economic and social policy, and various activities are being implemented to realise it. Integration into the European Union also strongly influences policy-making in Latvia. As such, the principles and main strategic considerations embedded in the European Union's approach to the development of a knowledge-based economy have been taken into account in Latvia's documents detailing the national strategy in this sphere. Development of a knowledge-based economy is a complex process that is influenced by a wide range of factors. Strategic documents covering key areas such as education, science, R&D, innovation and industrial policy, and information technologies, address the issue from different perspectives. In combination the strategies aim at the same overall objective, namely building-up the necessary preconditions for a knowledge-based economy that will lead to an improvement of the overall socio-economic situation in Latvia. The need to develop a knowledge-based economy has been stressed in the main strategic documents that lay the foundation for Latvia's future development.

1.1 Long-term economic strategy of Latvia

On 17 July 2001 the Cabinet of Ministers approved the 'Long Term Economic Development Strategy of Latvia' developed by the Ministry of Economy.

The strategy describes several key areas underpinning development: it details a long-term economic policy; it characterises trends in economic development including their pros and cons; it analyses development opportunities and risks; and it formulates political priorities and tasks. The document also describes the possible long-term development scenarios for Latvia with respect to external circumstances and degree of implementation of the strategy.

The long-term strategy for Latvia aims at:

- successfully integrating the country into the world economic and security system;
- coordinating political and economic decisions with the long-term goals of the State;
- establishing societal trust and belief with regard to the future growth and improvement of life, thus ensuring that State policy-makers are supported at all levels of society and also enhancing civic harmony and co-operation.

The strategy states that the main task of State economic policy is achieving parity with the living standards of developed countries in the near future. A more specific objective within the next 20 to 30 years is to reach the average per capita GDP level of the EU member States. To reach this goal, there should be a high rate of convergence. For the beginning of the period, until approximately 2010, this requires at least 4 to 5% growth per year.

The scenarios depicting Latvia's sustainable economic development, and predicting varying degrees of success, depend on external political and economic processes and on the ability of the country to adapt to them. Furthermore, the country's development

depends on its ability to leverage its existing economic - and other - advantages as well as its development of internal political, economic and social drivers.

The desired convergence process, bringing Latvia's knowledge-based economy into line with that of other EU countries, will drive the country's strategic objectives if favourable conditions exist and opportunities are maximised.

Latvia needs to shift away from an economic model based on the use of cheap labour, exploitation of available natural resources, and low value-added. This model does not support high economic growth and improved future welfare. Taking into consideration the limited natural resources, low capacity of the economy and the small internal market, as well as unfavourable demographic conditions, the most realistic way of developing the national economy to achieve the necessary GDP growth is through intensive use of knowledge and high tech production. In short, a move to a knowledge intensive economy.

The enabling conditions to promote this new economy should be created at the same time as restructuring the industrial and traditional sectors of the economy via a shift to higher tech forms of production. The development of a new post-industrial sector and the promotion an information society is also vitally important. Development of innovative, knowledge-based and science-intensive sectors of the national economy is a priority for ensuring the overall economic development of Latvia.

The Cabinet of Ministers has determined that in the future strategic documents determining economic development (such as the National Development Plan, national programmes, sector strategies and development programmes) should be coordinated with the goals and priorities set out in the Long Term Economic Development Strategy of Latvia.

1.2 National Development Plan

The Cabinet of Ministers in December 2001 approved the National Development Plan (NDP). NDP is one of the key strategic planning documents designed for the period 2003 to 2006. NDP is harmonised with the Long Term Economic Development Strategy of Latvia and reflects the priorities, tasks and the implementation process defined in the strategy. The aim of the NDP is to foster the socio-economic development of Latvia.

Key goals of NDP are to promote:

- sustainable development of Latvia by improving welfare and social protection of every person;
- regional development by decreasing and eliminating unfavourable regional differences and supporting favourable regional disparity.

The document also spells out the following priorities:

- promotion of economic and competitive development;
- development of human resources and promotion of employment;
- sustainable and balanced development of the entire state territory.

To implement the above priorities, the creation of an environment favourable for business and foreign direct investment is planned. This in turn will promote:

- diversification of the economy encouraging a shift to higher value-added production;
- development of an infrastructure that supports the economy;
- improved labour skills and capabilities in line with the demands of the labour market;
- an active labour market fostering higher employment;
- development of a social infrastructure and services;
- formation of a focussed State support policy for regional development thereby promoting a balanced development of cities and rural areas;
- a sustainable use of natural resources.

Priorities are horizontal and oriented towards the attainment of the general goals of the NDP.

The Action and Finance Plan is an important part of the document which is linked with the priorities set in the NDP. The Implementation of the Plan, not only in terms of financing but also in terms of quality, is engineered to guarantee the attainment of priorities and the general stability of the socio-economic development of the State. Acknowledging the limited financial options for State sponsored development programmes, the Action and Finance Plan is focused on sustainable and balanced development in line with what can be achieved.

The Action and Finance component of the NDP contains a list of projects and programmes to be implemented and identifies the financing needed for reaching the objectives and tasks set out in the chapter priorities. The following criteria were taken into consideration in the project preparation and evaluation, including:

- the value added of the project promoting GDP growth;
- the target territory of the project;
- the international competitiveness, the status of the sector's technological uptake compared to international standards, and the development potential of the sector;
- the level of academic and professional education compared to international standards;
- the demand for products produced by the sector in the domestic and international markets;
- impact on employment growth;
- the economic use of energy resources and non-renewable raw materials;
- the environmental impact of the project;
- sectoral growth and development potential in the short-term;
- the requirement for a short pay-off period on investments;
- the impacts on societal and cultural aspects;
- international commitments;
- attracting financial resources to projects and programmes.

Sources of public financing (central government core budget, special budgets, Public Investment Program, resources of local governments) will be used for funding the projects included in the Action and Finance Plan of NDP. This funding will go alongside international financing (e.g. EU programmes such as PHARE, ISPA,

SAPARD etc. as well as multilateral finance from the World Bank, the European Investment Bank, etc.) and private investments.

The future distribution of public investment will be based on the NDP. After 2003 it will also become the basis for receiving assistance from pre-accession financial instruments, such as PHARE (Economic and Social Cohesion), and can be used to prepare ISPA and SAPARD programmes. The NPD will also serve as an important source of information for foreign countries and international institutions to establish and reinforce cooperation in potential development areas. In turn, this will encourage external fundraising to complement State guaranteed financing.

After Latvian accession to the European Union, the NDP will be transformed into a united programme document. The NDP will both draw financial support to development projects from the EU Structural Funds while , at the same time, retaining the decisive role in the distribution of local public investment and the attraction of alternative financing.

1.3 Industrial development guidelines

The purpose of the guidelines for industrial development is to define the principles of Government economic policy to enhance the competitiveness of Latvian industry and to set up medium-term priorities for achieving this objective.

Industrial policy has two identified priorities, these are:

- the creation of an environment favourable for reindustrialisation (renewal of the industrial sectors based on modern technology) and industrial development;
- the creation of an effective and competitive structure for the industrial sectors.

Critically, those sectors with potential for high value added production and where Latvia has a comparative advantage, require public support.

When selecting the priority sectors for State support the economic development trends in Latvia and internationally need to be taken into account. These trends include:

- the high value added nature of products from sectors that are significant contributors to GDP growth;
- the knowledge-base of specialists available in Latvia (competency, qualification, experience);
- the international competitiveness of the sector's technological development and the existing institutional and human resource basis for innovation in the sector;
- the capacity level of both academic and professional education, essential for the development of the sector, as compared to international standards;
- demand for the sector's products both within the domestic and international markets and the likelihood of a stable future market;
- the economic utilisation of energy and non-renewable resources;
- production processes that are environmentally friendly and utilise renewable natural resources;
- a short payback period for investments.

To boost the effectiveness of the Latvian industrial sector, it is essential to support high-tech industries that utilise skilled labour. As a small country, Latvia has limited opportunities to carry out wide scientific research and technological activities in a large number of industries. Latvia, however, has good prospects for developing those high-tech industries where there is existing knowledge and specialist skills. For several reasons, these sectors are responsible for only a small share of total industrial output.

These industries include:

- information technologies;
- specific branches of chemistry and pharmacy;
- sub-sectors of material technologies;
- biotechnology;
- wood chemistry;
- composite materials, etc.

Within the overall development context, special attention should be paid to the nurturing of information technologies for a number of reasons:

- firstly, investments in information technologies have not only a direct but also a hidden positive impact upon productivity as the use of information technologies allows a more efficient utilisation of productive resources;
- secondly, taking into account Latvia's strong human resource and specialist skills base, the country possesses information technologies that could become significant export earners;
- thirdly, the development of information technologies already has, and can create in the future as well, several new types of services which can generate significant income (logistics, e-commerce, etc.).

1.4 National concept of innovation

On 27 February 2001, the Cabinet of Ministers approved a National Concept on Innovation. The concept highlights the need to promote an environment favourable to innovation. The Concept paper recognises that in order to enhance the overall level of State competitiveness, a targeted public innovation policy is required to accelerate the development of new knowledge based sectors and increase the share of high value added products within traditional sectors.

The ability to generate new ideas and use them commercially is the main driver of economic growth. This process is equally important for all business areas and sectors (industry, services, tourism, and agriculture), all types of businesses (micro, small, medium, large enterprises and multinational corporations), as well as for all social groups and regions. The dynamics of economic development are no longer determined solely by labour, natural resources, capital and the traditional industrial and agricultural sectors. Increasingly, high-tech sectors are determining economic growth. The high-tech component has become the main source of competitiveness and value added in all sectors of the economy. Yet, the development of high-tech companies and the use of new technologies by traditional sectors require an economic environment favourable to innovation and innovative companies.

The national concept paper identifies Government priorities to improve the environment for innovation. In elaborating the concept, the main policies and strategic decisions of the European Union were considered, notably the final conclusions of the European Council special meeting held on 23-24 March in Lisbon. This meeting aimed at reaching an agreement on new strategic goals and direction in order to strengthen employment, economic reform and social cohesion.

The concept paper seeks an open economy to promote innovation in Latvia:

- **in the long term** – to ensure a sustainable, balanced and stable growth of the national economy and to reach the average development level of the EU member States, at the same time strengthening the State's security and defence, and its protection of environmental, cultural and social spheres;
- **in the medium term (3 to 5 years)** – to achieve an annual GDP growth rate of 7 to 9%, reduce the trade deficit and reach an increase the share of high-tech in total exports up to 20%.
- **in the short term (1 to 3 years)** – to boost government and social attitudes and understanding with respect to education, science, and innovation as a whole and the practical application of knowledge in entrepreneurship
- .

1.5 National innovation programme

Based on the National Concept of Innovation, a national innovation programme is being developed in line with the principles reflected in the Communication of the Commission on "Innovation in a knowledge-driven economy".

Prior to the elaboration of the national programme, a research study was carried out exploring innovation within the Latvian system. The analysis included: an overview of the infrastructure supporting innovative entrepreneurship; an audit of innovative entrepreneurship; an analysis of public and private financing of research & development in different branches of science; an analysis of the impact of legislation on promoting innovation; and a review of existing legislation.

On the basis of this research study, the National innovation programme and its accompanying action plan are being worked out. The promulgation of a law "On science, technology, and innovative entrepreneurship" will be included as one of the topics in the National innovation programme action plan. After the Cabinet of Ministers have approved the National innovation programme implementation will commence.

The action plan will contain, inter alia, the following actions:

- support for international technology transfer;
- development of the capacity of enterprises to adapt to new technologies;
- development of an innovation support infrastructure (technological parks, centres, business incubators, contacts with universities and research laboratories);
- support for new technological SME developments (start-ups and spin-offs);
- creation of a sub-programme on technology transfer stimulation;
- development of a credit system for purchasing of new technologies;

- development and practical implementation of an entrepreneurial component in the primary, secondary and tertiary education curriculum;
- creation of an environment supportive to innovation and the involvement of SMEs, as well as the production of science-based products as part of development projects to promote international technology transfer.

A working group, under the guidance of the Minister of Education has worked out guidelines for the development of tertiary education, science and technology for 2002 to 2010. They cover: research, development and related practical applications; development of the tertiary education system and science infrastructure; and the upgrading of both legislative and administrative bodies regulating actions in the science and technology sphere.

1.6 National ICT strategy

Since the early 1990s, the Republic of Latvia has been developing strategies and policies to promote the formation of an Information Society. Today, a strategy is being developed based on a number of conceptual documents which include:

- the National Programme on Informatics;
- "e-Latvia", a socio-economic programme;
- the national concept on e-commerce;
- the national concept on Internet Development;
- the national concept of e-governance.

The Latvian Government has approved all of these programme-related documents.

1.6.1 National program on informatics

The basis for Latvia's drive towards an Information Society is the National Program on Informatics which was approved by the Cabinet of Ministers on March 30, 1999 and updated in 2000.

The goal of the National programme on Informatics (1999–2005) is to integrate Latvia more effectively into the process of globalisation and to move Latvia towards an information-based society.

The National programme on Informatics was developed on the basis of the Cabinet of Ministers (CM) regulations No. 129, dated May 9, 1995, and entitled the Procedure of Development and Implementation of National Programmes. The list of national programmes in compliance with CM Directive No. 146, dated 30.04.96, On National Programmes for Implementation of the Economic Policy, was supplemented by the Program on Informatics by Resolution No, 172 of CM, 09.04.97.

The expert panel for elaborating the National program on Informatics was approved by the Minister of Transport Directive No. 47 of 12.05.97 entitled Creation and Functions of the Expert Panel for the Development of the National Program on Informatics.

The National Program on Informatics is an ambitious programme for 1999–2005 and consists of 13 sub-programmes.

The programme contains the following: a detailed analysis of the current situation; objectives of separate sub-programmes, including tasks and priorities; risk factors; and a description of the programme implementation process. Each sub-programme will yield concrete projects.

The programme's key economic objective is improved societal welfare with an emphasis on regional development across the country. The regional development drive includes plans to: establish workplaces in remote areas; and develop small-and medium-sized enterprises.

The political objectives of the programme are geared towards further democratisation of Latvia, its integration into the European Union, and upgrading of public administration. The social objectives of the programme are aimed at ensuring strong retention of the Latvian national identity across all societal strata and within the institutions of the State while acknowledging the importance of multicultural and multilingual Europe.

The programme aims at achieving a 'universal information service' by ensuring quality access for all citizens to all types of information media in compliance with the rights set out in the normative acts.

The universal information service will be realised through the implementation of a number of sub-programmes:

- 'Informational sub-programmes' will establish a variety of both generally available and confidential public and municipal information systems.
- 'Communications sub-programmes' will ensure all types of information transmission and supply to users.
- 'Normative sub-programmes' will put in place legislation, standards and Latvian cultural requirements.
- 'Knowledge sub-programmes' will promote higher educational standards across society as well as the development of scientific research and information technologies.
- 'Applied sub-programmes' will be dedicated to promoting the application of information technologies and projects, and to determining priorities.

For Latvia, the development scenario offered by the programme has a range of potential advantages, including a shift in the fundamentals of the society and associated economic activities to ensure maximisation of the benefits to be derived from information and knowledge. Such a shift will greatly enhance Latvia's development possibilities and, ultimately, will reduce the enormous disparity between such a small country and the big powers. With the emergence of a knowledge-based economy, this programme is the only efficient means to ensure the country's rapid economic, political and social progress.

Currently, the total known number of programme projects for 1999 to 2005 stands at 122. The programme financing needs are estimated at 243 million LVL.

By approving the National Program on Informatics, Latvia has already made a major step in defining its approach to the development of the country. To realise the programme, intense coordination work is being carried out in several spheres. For

example, a number of normative acts have been adopted. The creation of the national integrated information system (mega system) and the development of its numerous parts are underway.

1.6.2 Socio-economic program "E-Latvia"

E-Latvia is a socio-economic programme with the aim of increasing the effectiveness and competitiveness of the national economy within the global marketplace, and to accelerating the improvement of welfare levels across society. E-Latvia supports the sustainable development of Latvia. The programme was approved by the Cabinet of Ministers on 12 December 2002 and has to be implemented by the end of 2004.

The E-Latvia programme serves as one of the key mechanisms for the National Informatics Programme. The goals and missions within E-Latvia mirror the European Union's E-Europe Programme. The basic strategic goals of E-Europe were defined during the European Union Summit in Lisbon on 23/24 March 2000. In line with the E-Europe, the E-Latvia programme has to achieve the following:

- encourage the formation of the basic conditions, principles and processes of a *new economy*;
- create opportunities for every citizen and business to fully participate in the processes of *the new economy* in Latvia;
- promote an increase of the welfare level of every person, to encourage civil harmony in the country, as well as economic and social cohesion.

The E-Latvia Programme includes the following key components and related tasks:

General Internet access: cheaper, faster and secure connection

A quality internet and telecommunications connection for all consumers and businesses, at a socially affordable price, is a basic precondition for the development of the information society.

There is a need to boost country-wide coverage of Internet services and, to achieve this, speed the digitalisation of the telecommunications network which currently stands at just 45%. A stable and secure Internet connection is possible near to the optical trunk cable (mainly in the centres of the districts), while in provincial cities and in the countryside connections are a problem. The connection time for leased lines in many places is unacceptably long.

The existing price for Internet connections is too high for individual users and even for municipalities and small-and medium-sized enterprises. Access to the Internet, therefore, remains unsatisfactory and the capacities of the leased lines are minimal. As a result, Internet penetration in Latvia only stands at approximately 10% of the population. This means there is a real development gap from the leading countries in this field of three to four years. Household Internet connections do not exceed 1%.

In order to ensure higher Internet penetration, a focus on group access – to connect all libraries, schools, and municipalities and to install public terminals in the short-term –is critical. Particular attention needs to be paid to remote and disadvantaged regions.

The liberalisation of the information market and telecommunications services is critical especially if it is carried out in accordance with the EU principles. For example, there needs to be services of greater quality, availability and affordability at decreasing prices. It is important that liberalisation is built into the draft law On Telecommunications and that anti-monopoly legislation is applied to all Internet services. The increase of availability (as relates to penetration, quality and prices) of data transmission services is anticipated as a result of the opening of the leased lines' market and the improvement of competition.

As commercial use of the Internet builds the on-line security challenge also rises. To boost security provisions, the State must move to close legislative loopholes and must encourage fair competition in the provision of Internet services. The creation of a dedicated regulator to create a suite of Internet regulations is required e.g. inclusion of Internet services into the set of universal service, the authorisation and liability of the information and service providers, and the use of domain addresses as a national resource). Such a regulatory initiative will insure a logical system of security. For the protection of Internet users' information, both the drafting process of the normative acts as well as the beginning of the functioning of the Data Protection Inspectorate needs to be accelerated.

Tasks:

Total digitalisation of the telecommunications network	01.01.2002
Total liberalisation of the telecommunications market, opening of the market for leased lines	01.01.2003
Regulation of the Internet segment and services, liability of the service providers for the data security	01.01.2002
Installation of public Internet terminals in each library, school, municipality	01.01.2004 (gradually)
The insurance of the personal data protection	01.01.2002.

General information literacy and availability

The basic goal of the education system must be to develop an enterprising population which knows how to transform wisdom into prosperity. To maximise economic development every school and library, each enterprise and citizen must be encouraged to actively participate in knowledge management process. Society-wide information access is a goal and the division into "information rich and information poor" must be avoided.

Informatisation of Latvia's schools must be accelerated and computerisation for teachers and trainers also needs to be speeded up. All schools must be connected to the Internet to maximise benefits and to boost the use of the Internet in the study process. Information literacy should be included into the curriculum of each high school catalysing an interest in life-long learning.

The introduction of distance learning, especially for post-diploma and further education and for intensive retraining, gives everyone flexible educational opportunities irrespective of age, residence or social status. Regular training in reality will become an integral and necessary part of work. The European Computer Driving License should be

introduced in Latvia as a quantitative confirmation of the ability of every employee to use advanced technologies in his work.

Libraries must become the major suppliers of all types of information (scientific/technical, financial/business, educational/reference etc.) across the country. The development of an electronic and virtual library will increase opportunities for searching and for receiving both local and global information daily. The connection of all libraries into a unified information network, their interoperability with the national and international information resources must be viewed as the most important part of the Project of the National Library.

Tasks:

Informatisation of all Latvian educational establishments, elaboration of methodological materials, training of teachers, installation of technologies, connection to the Internet	01.01.2004 (gradually)
Improvement of the high schools curricula, information literacy training	01.09.2002
Introduction of distance learning programmes and services	non - stop
Opportunities for training and obtaining a European Computer Driving License	from 01.04.2001
Development of the unified library network	01.01.2004. (gradually)

Information services and applications

During initial uptake, international connectivity was the main factor in Internet development for Latvia. As the internet was developing in Latvia, there was a boom in other national information sources (e.g. catalogues and directories, full text and image databases, www. sites etc). As a result, more than 60% of the total Internet traffic is currently within Latvian borders. Also, outgoing traffic from Latvia is increasing rapidly. National information is gaining greater interest amongst the international community.

Many tasks remain, however, to forge a successful information highway to serve Latvia. Increasingly, other information services are gaining in importance such as: the storage and processing of a vast amount of information; educational processes underlining the economic and social benefits to be derived from the use of information; eliminating systemic problems; and creating information systems and services in the Latvian language.

National identity cards to allow access to the entire information network are required. Additionally, the normative acts and other arrangements allowing the introduction of electronic documents need to be approved as early as possible to allow greater freedom over legal and financial activities as well as to promote E-commerce and E-government transactions.

E–commerce, by integrating all types of commercial activities into the Internet environment, will increase the competitiveness of the national economy in the global market place. Furthermore, E-commerce will: encourage the development of new kinds of business activities; establish new highly-skilled jobs; give greater opportunities for regional development; and support small and medium size enterprises. The spread of telework principles will boost flexible employment opportunities. Teleworking will create new possibilities to coordinate job creation in Riga, other cities and the countryside while helping to minimise the drain of qualified employees abroad. E-commerce also has the potential to allow disabled people full opportunities to work and to be integrated into society.

In order to establish basic principles of E-government, the development of the information megasystem and the exchange of electronic documents between state and municipal institutions must be accelerated. Every citizen and enterprise must have an opportunity to receive in the Internet environment, public sector information services, which are personalised and client oriented. The public sector information portal must be created as a one-stop access point to every public institution and to every service.

Tasks:

ID card as a universal access tool to information services	from 01.07.2001
Clarification on the use of electronic documents, their legal status, status of electronic signatures, encryption, and archiving of documents	01.01.2002
Formation of a favourable environment for E-commerce, normative and social problems, consumer protection, intellectual and industrial property etc.	01.01.2002.
Development of E-government, creation of the mega system, exchange of electronic documents in the all levels of public administration (transactions: government – government; government – municipalities)	01.01.2004. (gradually)
Availability of public sector services in the Internet environment (transactions: government-businesses; government-citizens)	01.01.2004 (gradually)
Public sector information portal	

1.6.3 Concept of e-commerce

The goal of the national e-commerce concept is to clarify the general structure of e-commerce including infrastructure, education and law.

The concept was developed following the decision of the Cabinet of Ministers No.159 “about establishing a working group for developing a concept of e-commerce” on 5 May 2000. The concept was approved at the Cabinet of Ministers in 2001.

The concept provides the basis for a long-term action plan focused on rapid and adequate problem-solving, employing all instruments that are available to the Government.

Close collaboration between government institutions and the private sector is of vital importance to the realisation of the e-commerce concept. The e-commerce concept took into consideration documents of different government and international organisations, including: the UNICITRAL model law on e-commerce; the WTO position; the OECD and UNCTAD recommendations; the directives stemming from e-Europe which regulate the operation of IT service providers; the annual report of the e-commerce work group of the US Government; and the E-Latvia programme.

1.6.4 Concept of the Internet development

To promote the development of the Internet and to ensure that Internet service providers work under conditions of free and fair competition, the Government has adopted a conceptual document on the matter. This concept paper advocates the registration of Internet service providers and the establishment of a national supervisory system in this area. The Cabinet of Ministers approved the concept in late 2001.

The Government will promote the development of the Internet, as well as of the availability of Internet services to the country's residents at a price that is in conformity with the National Informatics Program (1999-2005). The latter discusses the accessibility of information services and the basic elements of the socio-economic e-Latvia program.

The Government's policies insofar as the Internet is concerned are aimed at creating a favourable environment for the relevant technologies and for the attraction of investment. The policies are based on the free market and on competition, encouraging the availability of services from various telecom technologies. At the same time, the policies seek to protect the interests of Internet service providers and service users through a licensing of Internet service providers and through a supervision of Internet domains. The interests of Internet service users are to be protected through ISP registration (general authorisation) and by basic principles, which are conditional with respect to Internet web addresses.

1.6.5 Concept of E-governance

The e-governance concept was accepted by the Cabinet of Ministers on 20 August 2002. The primary strategic goal for E-government is to ensure that Latvia is a competitive country and that its residents are also competitive in terms of ensuring welfare gains in the information age. Strategic benefits will include the following things:

- more convenient, better and more high-quality public services;
- a better environment for business and investment;
- a more targeted and effective use of Government investment;
- a strengthening of democracy with greater participation by the country's residents in Latvia's system of governance;
- the assurance of transparency in the work of government institutions;
- a strengthening of the country's capacity of governing;
- more highly-qualified and motivated staff;
- the promotion of E-commerce in Latvia.

These goals are to be reached in five or six years. If this is to happen, however, the Government will have to make sure that:

- the establishment of E-government and the relevant modernisation of the State becomes a national priority, which is just as important as the country's accession to the European Union and NATO;
- The creation of an "E-minister" and the establishment of a centralised and professional project management and coordination institution (one that is overseen by the Cabinet of Ministers or the National Chancellery);
- A new procedure for investment management and project management is introduced so as to improve the system of governance, ensuring the efficient use of investment and making sure that IT projects are related to general goals in terms of improving governance;
- Governing political forces are all agreed on the basic positions of modernising the country's system of governance;
- The public understands and supports the modernisation of governance;
- The Internet is accessible;
- People and companies trust E-documents and their use;
- The experience of the rest of the world is used.

1.6.6 State projects on the Information Society development

In order to reach the aforementioned goals, the Government makes annual investments in projects which are aimed at the development of the Information Society in Latvia. Public sector investment in this process involves a government budget contribution of Ls 22 million (see the table below).

Additionally, a significant number of Information Society-related projects have attracted financing from international organisations such as the PHARE Program, the World Bank, the OECD, etc.

Table 1.1. Informatics and Communications Sector Investment in the 2002 Latvian National Investment Program (millions of lats)

Project	Code	Long-term obligations	Financing
MINISTRY OF DEFENCE			
Development of the information system of the National Armed Forces	MD 10-03	2,000	2,000
Development of the IT and information security of the Defence Ministry and the National Armed Forces	MD 03	-	0.428
Establishment of a national cartography system	OP 17	0.420	0.420
Improvement of the logistics system of the Defence Ministry and the National Armed Forces in line with NATO standards	MD 32	-	1,072
MINISTRY OF ECONOMY			
Establishment of an environment for	EM 04	-	0.050

cooperation among the ministry's information systems			
MINISTRY OF FINANCE			
Integration of the State Revenue Service's information system into EU information systems	OP 07	-	0.205
Modernisation of the National Treasury	OP 09	0.780	0.780
An information system for the country's revenue and customs policies	OP 13	2,100	2,100
A unified information system for financial and fiscal policies	OP 18	0.098	0.098
MINISTRY OF WELFARE			
Establishment of a unified mobile communications system for emergency medical aid services and the Latvian Centre for Catastrophe-Related Medicine	WE 09-81	0.150	0.150
An information system for the National Labour Inspectorate	WE 15	0.039	0.039
Establishment of a unified information system for the pharmaceutical sector	WE 15-4	-	0.028
Establishment of a unified information system for the Expert Commission on Health and Work Ability Analysis and its structural units	WE 15-5	-	0.045
Establishment of an information system for the Social Aid Fund of the Welfare Ministry and for social aid institutions	WE 20-01	0.030	0.030
Computerisation of the National Employment Service	WE 01	0.180	0.430
MINISTRY OF EDUCATION AND SCIENCE			
Establishment of the Latvian Education Informatisation System	ED 05	-	3,000
MINISTRY OF CULTURE			
Establishment of an information system for cultural management	CU 32	-	0.100
Establishment of a unified information system for the national archives	CU 32-01	-	0.050
Establishment of the national unified library information system	CU 33	-	0.500
A catalogue of the collection of the National Museum of Art	CU 34	-	0.080
Establishment of a modern set of audio-visual education at the Latvian Academy of Music	CU 36-02	-	0.051
Visual communications for the Latvian Academy of Art	CU 37-02	-	0.027
MINISTRY OF INTERIOR			
A unified and automated information system for the ministry	IA 04	0.400	0.400
Development of the ministry's	IA 09	1,000	1,000

communications system			
A data register for the National Road Police	IA 21	-	-
Establishment of an information system for border guarding and border control	IA 22	4,656	4,657
Improvement of the infrastructure of the Population Register and modernisation of the information system	IA 30	0.100	0.100
A refugee and migration management system	IA 50	-	0.031
MINISTRY OF TRANSPORT			
The Baltic States Data Transmission Network	TRt 14	0.250	0.250
An integrated system for information of national importance	TRt 20	-	0.100
A unified exchange system for electronic documents	TRt 23	-	0.200
An archive for electronic documents	TRt 23-01	-	0.025
MINISTRY OF JUSTICE			
A unified information processing system for Latvian courts	MJ 10	0.600	0.600
Establishment of an automated system for the naturalisation process	MJ 17	0.075	0.075
Expansion and modernisation of the court expertise scientific research laboratory's computer network	MJ 19	-	0.025
Ensuring the quality of Company Register Services in the context of the State Revenue Service informatisation project	MJ 27	-	0.118
Introduction of electronic documents in the Company Register's system of commercial pledges	MJ 31	-	0.150
Unified registration of legal persons	MJ 33	-	0.120
A unified information system for registration of personal data processing at the National Data Inspectorate	MJ 34	-	0.100
MINISTRY OF ENVIRONMENTAL PROTECTION AND REGIONAL DEVELOPMENT			
A system for Latvia's environmental control laboratories	EV 16	0.090	0.090
Establishment of a unified information system of environmental data	EV 17	0.150	0.150
Establishment of a unified network of tourism information centres	EVr 01-07	0.050	0.050
MINISTRY OF AGRICULTURE			
Establishment and development of an agriculture administration and control system in accordance with EU requirements	AG 13	-	0.221
Establishment and development of a fishing administration and control system in accordance with EU requirements	AGs 12	-	0.029

The "Forest Fund" register of forest resources	OP 19	-	0.110
THE NATIONAL LAND SERVICE			
A computerised real estate register	OP 05	0.011	0.250
The national geographic information infrastructure	OP 25	-	0.030
THE SECRETARIAT OF THE MINISTER WITH SPECIAL DUTIES IN THE AREA OF NATIONAL REFORMS			
The Unified Local Government Information System project	EV 63-01	0.540	1,500
A unified registration system for government institutions and personnel	OP 06-02	-	0.080
	TOTAL	13,719	~~22,144~~

Source : Latvian National Investment Program, 2002

2. The Institutional Regime

2.1 General information on political system and State institutions in Latvia

(Ministries, their fields of competency, and relevance to the development of "the knowledge-based economy")

Latvia is a parliamentary republic. It is governed by the President, the Cabinet of Ministers, and the Parliament (Saeima). The fundamental principles of the State structure were established in the original Constitution of 17 February 1922.

The Saeima is a legislative body, consisting of 100 deputies. The citizens of the Republic of Latvia elect the Saeima for four years and the selected political parties propose candidates for the positions of deputies in accordance with the election results. The Saeima elects the **President** of the Republic of Latvia for a period of four years. No person can be in the President's office for more than two terms. While the President of Latvia has mainly representational functions, one of the most important duties is to nominate the candidate for the position of the Prime Minister and to recommend that person for the approval of the Saeima.

The Cabinet of Ministers is the highest executive body in the country. While the Prime Minister forms and leads the Cabinet of Ministers, it is ultimately the responsibility of the Saeima to elect the Prime Minister and the Cabinet of Ministers.

Currently there are 14 ministries operating in Latvia, each of them developing and implementing their respective policies according to their responsibilities:

- Ministry of Defence
- Ministry of Foreign Affairs
- Ministry of Economy
- Ministry of Finance
- Ministry of Interior
- Ministry of Education and Science

- Ministry of Culture
- Ministry of Welfare
- Ministry of Transport
- Ministry of Justice
- Ministry of Environmental Protection and Regional Development
- Ministry of Agriculture
- Minister for Special Assignment for Cooperation with International Financial Agencies
- Minister for Special Assignment for State Reforms

The development of the knowledge-based economy is a complex process, and each of the ministries influences the process to a larger or lesser degree by developing and implementing their policies. However, the most significant areas that are crucial for the development of the knowledge-based economy are:

- Education;
- Science and research;
- Innovation and development of entrepreneurship;
- Information technologies and infrastructure.

The Ministry of Education, Ministry of Economics and Ministry of Transport are largely responsible for policy development and implementation in the above mentioned areas.

The Ministry of Education and Science is a central state executive body responsible for the development and realisation of State policy in the area of science and education. The responsibilities of the Ministry may be characterised by the following activities:

- the drafting of laws and other projects, their co-ordination with European agreements and White Book recommendations,
- representation of the interests of the State in international relations; preparation and conclusion of international agreements,
- developing motions and moving proposals for grants from the State budget,
- organising the distribution of the State budget in the area of Education and Science,
- realisation of the management functions in institutions related to ministries,
- preparation of data together with the Central Statistical Bureau of Latvia,
- preparation and publication of analytical reviews.

Ministry of Economy

The Ministry of Economy is a central executive body that works in conformity with the Law on Ministerial structure and has the status of a legal entity. It is the main coordinator of the economic development strategy. The Ministry of Economics is responsible for development and implementation of enterprise, industrial and innovation policies. The main tasks of the ministry are:

- analysis and prognosis of national economic development, development of the State development strategy, co-ordination of national programmes and definition and realisation of the policy for reduction of economic differences between different territorial units;

- development and realisation of industry and energy policy;
- modelling of policy of external economic relations and trade;
- developing supporting policies for the promotion of business and the development of small and medium-sized enterprises;
- genesis and realisation of structural policy and policy for protection of consumer rights;
- development and realisation of privatisation policy;
- development of the State investments policy;
- development and realisation of foreign investment and export promotion policy;
- development and realisation of competition policy;
- provision of statistics.

There are 14 institutions under the supervision and monitoring of the Ministry of Economy that are involved in policy implementation.

Ministry of Transport

The Ministry of Transport is responsible for communications, information technology, transport, and transit sectors.

One of the key tasks of the Ministry is to develop and implement State policies within the fields of communications and informatics. According to the development strategies and national programmes developed by the Ministry, effective functioning and development of the aforementioned sectors are needed and that is critically important for the development of practically any sector of the national economy.

Within the field of communications, one of the main tasks is to ensure the development of the telecommunications sector according to the needs of the society.

Within the field of information technologies the Ministry coordinates the development of State information systems. The Ministry of Transport is responsible for implementation of the National "Informatics" programme, the main goal of which is the creation of an information society in Latvia.

2.2 Higher education institutions

There are currently 34 higher education establishments operating in Latvia, 20 of them are state-owned and 14 are private. The most significant state universities are mentioned below.

The University of Latvia

The University of Latvia was established in 1919 on the foundation of the Riga Polytechnic Institute (founded in 1862). In the period between 1919 and 1940, the University of Latvia was a great national centre of higher education, science and culture. It was the first institution of the classical type of universities in Latvia. The university, as a higher educational institution, promotes scientific and research work and prepares highly-qualified specialists in many areas. It shows the traditional links of science and education with the national economy. In the course of time, three academic

and research centres of the University were transformed into independent institutions, namely: the Latvian University of Agriculture (1939); the Latvian Academy of Medicine (1950 - in 1998 renamed Riga Stradina University); and the Riga Technical University (re-established in 1958). Now the University of Latvia with an enrolment of over 33,000 students is the largest higher education institution in Latvia and offers 89 academic programmes and 30 professional programmes in its 12 faculties which include:

- The Faculty of Philology
- The Faculty of Pedagogy and Psychology
- The Faculty of Foreign Languages
- The Faculty of History and Philosophy
- The Faculty of Biology
- The Faculty of Physics and Mathematics
- The Faculty of Geography
- The Faculty of Chemistry
- The Faculty of Economics and Management
- The Faculty of Law
- The Faculty of Theology
- The Faculty of Medicine

Number of students: 33,942
Academic staff: 801, including 94 professors
Research and Development personnel (FTE): 282

The Riga Technical University

The Riga Technical University was founded in 1862 as the Riga Polytechnic - a private institution. In 1958, the Riga Polytechnical Institute was re-established as an independent institution with its primary focus on Engineering within the University of Latvia. In 1990, the Institute gained its present name, The Riga Technical University, and there are now eight faculties:

- The Faculty of Architecture
- The Faculty of Civil Engineering
- The Faculty of Chemical Technology
- The Faculty of Mechanical Engineering
- The Faculty of Electrical and Power Engineering
- The Faculty of Automation and Computer Engineering
- The Faculty of Engineering Economics
- The Faculty of Radio Engineering and Telecommunications

Altogether there are 104 study programmes. Scientific research is carried out in each faculty, and also in several independent structural units. The University covers a broad spectrum of natural sciences and engineering, as well as architecture, engineering economics, ergonomics and environmental engineering.

Number of students: 13,878
Academic staff: 609, including 74 professors
Research and Development personnel (FTE): 453

The Latvian University of Agriculture

The Latvian University of Agriculture was originally the Agriculture Department of the Riga Polytechnic Institute in 1863. In 1919, it became the Faculty of Agriculture at the University of Latvia. The Faculty existed until 1939, when the Academy of Agriculture was established as an independent higher education institution. The Academy was renamed as the Latvian University of Agriculture in 1990. It is the only higher education establishment specialising in Agriculture in Latvia.

At present the University consists of seven faculties:

- The Faculty of Agriculture
- The Faculty of Economics
- The Faculty of Agricultural Engineering
- The Faculty of Veterinary Medicine
- The Faculty of Rural Engineering
- The Faculty of Food Technology
- The Faculty of Forestry

Number of students: 8,072
Academic staff: 392, including 28 professors
Research and Development personnel (FTE): 168

Riga Stradins University

Riga Stradins University (previously named the Latvian Academy of Medicine) was originally the Faculty of Medicine at the University of Latvia established in 1919. In 1950, the Faculty was separated from the University and the Riga Institute of Medicine was founded as an independent higher education institution. The title of Academy was obtained in 1990. The status of University Academy was granted in 1996 by the decision of the Higher Education Council. In 1998, the Constitutional Council of the Academy decided to change the name to Riga Stradins University.

The University has the following faculties:

- The Faculty of Medicine
- The Faculty of Stomatology
- The Faculty of Pharmacy
- The Faculty of Rehabilitation
- The Faculty of Nursing
- The Faculty of Social Sciences
- The Faculty of Public Health
- The Faculty of Postgraduate Education

Number of students: 2,268
Academic staff: 286, including 36 professors
Research and Development personnel (FTE): 115

Daugavpils Pedagogical University

Originally the Daugavpils Pedagogical University was the Daugavpils Teacher Training Institute (post-secondary), founded in 1923. In 1952, the Institute was re-organised into the Daugavpils Pedagogical Institute and was granted the status of University in 1993.

The University has the following faculties:

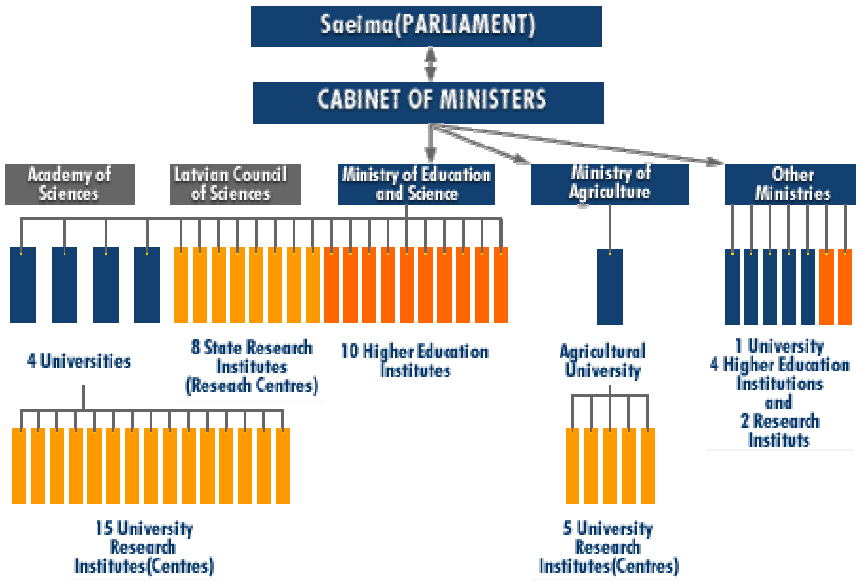
- The Faculty of Humanities
- The Faculty of Physics and Mathematics
- The Faculty of Biology and Chemistry
- The Faculty of Physical Education
- The Faculty of Music

Number of students: 4,007
Academic staff: 217, including nine professors
Research and Development personnel (FTE): 52

2.3 Science and research institutions

According to the law "On Scientific Activities" the structural organisation of the Latvian research system consists of the following institutions (see figure 2.1.)

Figure 2.1. Administrative structure of science and research in Latvia (Source: Ministry of Education and Science)



The Latvian Council of Science is a collegial body of researchers that deals with science and research problems within the country. The Council was founded in accordance with the decision of the Council of Ministers in July of 1990.

The Latvian Council of Science:

- makes conceptual proposals on science and technology policy for the Cabinet of Ministers and the Ministry of Education and Science;
- defines priorities for the development of science and research areas;
- proposes the draft of the state science budget for the current year;
- elaborates on projects for decisions and legislative acts aimed at developing an organisational and financing system for science and research;
- organises the evaluation and funding of basic and applied research projects;
- promotes co-operation and integration between research institutes and higher education institutions.

The Council consists of 20 members with representatives from:

- The Ministry of Education and Science,
- The Latvian Academy of Sciences,
- The Council of Rectors,
- The Latvian Academy of Agricultural and Forestry Sciences,
- The Latvian Association of Scientists,
- Expert Commissions (currently 14).

The Latvian Academy of Sciences after its re-organisation became an autonomous legal entity in 1992. It now functions as a high-level honorary and advisory body in accordance with its newly developed Charter and Statutes. The main aims and tasks are:

- to favour research in the basic and applied sciences, especially interdisciplinary research;
- the promotion of studies of Latvian history and culture;
- the development of Latvian language studies;
- to participate actively in the establishment of a Latvian science policy and provide consultation to the Government on scientific issues;
- to become involved in the publication of scientific literature;
- the development of scientific terminology and the maintenance of high scientific standards in encyclopaedias;
- the management of congresses, conferences and discussions;
- the awarding of prizes for the best research results;
- the popularisation of research achievements within the community;
- the maintenance of international contacts;
- the protection and maintenance of professional research ethics, discussion principles and
- universally accepted traditions.

There are five main types of institutions, which carry out the major research and development activities in Latvia (see Table 2.1.).

Currently in Latvia there are 12 State research institutes and 20 university research institutes each with an independent legal status. At present, 25 of these are supervised by the Ministry of Education and Science, five by the Ministry of Agriculture, one by the Ministry of Economic Affairs and one by the Ministry of Welfare.

Table 2.1. Research institutions in Latvia

Institution type	*Number of institutions*	
	1996	**2000**
State research institutes	26	12
Other state research organisations	16	15
Higher Educational Establishment	11	12
University research institutes	7	20
Research units in the business enterprise sector	35	30
TOTAL	**95**	**89**

Source: Ministry of Education and Science

There are various other organisations with an independent legal status, whose primary function is not research. These organisations include: the National Botanical Garden; The Latvian Academic Library; breeding and selection stations; engineering centres and others. The state research institutes are:

- The Augusts Kirhensteins Institute of Microbiology and Virulogy
- The Institute of Aquatic Ecology at the University of Latvia
- The Institute of Economics
- The Institute of Literature, Folklore and Art
- The Institute of Physical Energy
- The Latvian Institute Organic Synthesis
- The Latvian State Institute of Wood Chemistry
- The Ventspils International Radio-astronomy Centre
- The National Botanical Garden

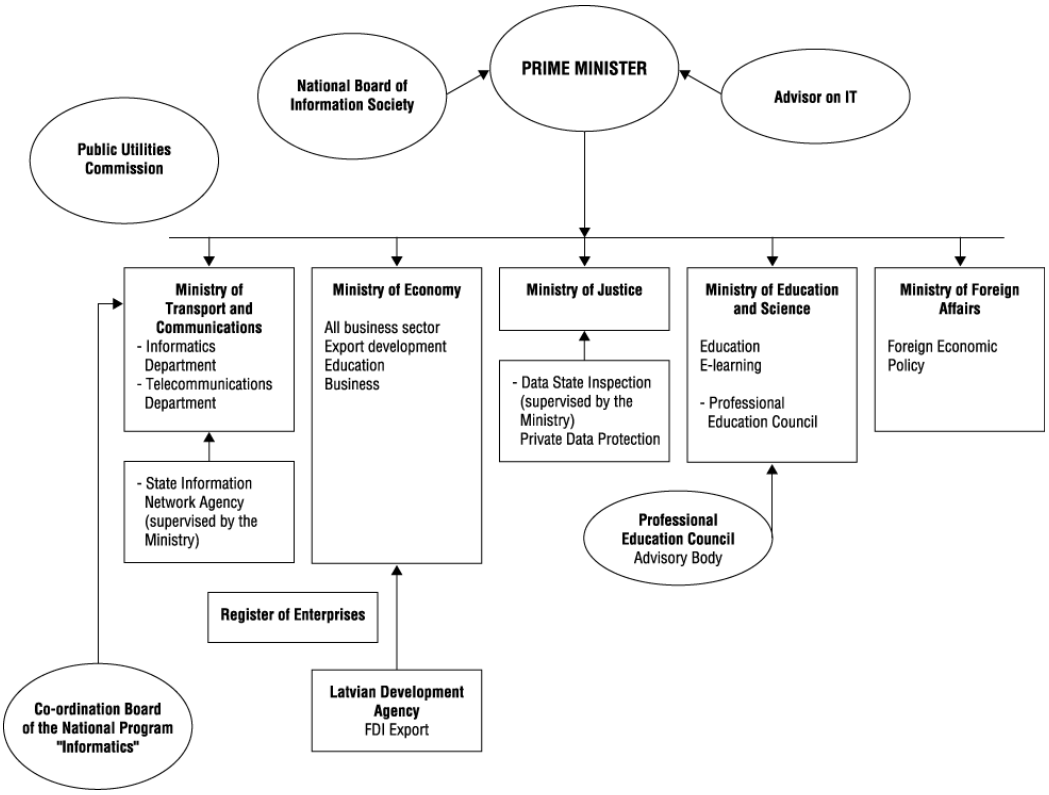
Among the most significant university research institutes the following can be noted:

- The Institute of Solid State Physics at the University of Latvia
- The Institute of Mathematics and Computer Science at the University of Latvia
- The Institute of Physics at the University of Latvia
- The Institute of Polymer Mechanics at the University of Latvia
- The Institute of Mathematics at the University of Latvia
- The Bio-medical Research and Study Centre at the University of Latvia
- The Institute of Biology at the University of Latvia
- The Institute of Microbiology and Biotechnology at the University of Latvia
- The Institute of Inorganic Chemistry at the Riga Technical University
- The Latvian Language Institute at the University of Latvia
- The Institute of Latvian History at the University of Latvia
- The Institute of Philosophy and Sociology at the University of Latvia
- The Institute of Electronics and Computer Science at the University of Latvia

2.4 The institutional regime in the ICT sector

The Ministry of Transport, Department of Informatics and Department of Telecommunications are the main authorities responsible for developing a strategic framework for the ICT sector in Latvia. The following figure shows the coordination mechanism for the ICT sector that exists in Latvia today.

Figure 2.2. ICT authority structure in Latvia (Source: Ministry of Transport and Communications, Department of Informatics, Republic of Latvia)



The main task of the Department of Informatics of the Ministry of Transport and Communications is to develop and implement the co-ordinated state policy in informatics based on the National Program (Action Plan for years 1999 – 2005), approved by the Cabinet of Ministers on March 30, 1999.

The State Information Network Agency (Latvian abbreviation VITA) is a non-profit State company providing customers with data networking services across Latvia. The VITA network is a private or closed network. This means that the users of this network are State and municipal institutions and organisations and, in special cases, a limited number of private companies. All State ministries and departments, border control and custom points and offices, as well as the State registers, are VITA customers. VITA participates in e-government projects and will be the gateway to EU networks (IDA and others).

The Data State Inspection, which begun its work on January 1, 2001, is an independent institution under the supervision of the Ministry of Justice. The main functions of the Inspection are: to control and supervise the correspondence of personal data processing in accordance with the Personal Data Protection Law in Latvia; to monitor information system security requirements in personal data processing systems; to register personal data processing systems; and to establish a unified personal data processing system register, etc.

2.4.1 Main laws and regulations in the area of ITC

It is impossible to develop any economic sector without appropriate legislation, and one of the main strategic missions for the Department of Informatics of Latvia's Ministry of Transport and Communications is to coordinate the adoption of laws and other regulatory enactments in the area of informatics. Even when the department was established in 1996, it was already quite clear that a whole package of legislation would be necessary in this sector.

Mentioned below are some of the main laws and regulations in the area of IT in Latvia, including those, which are only drafted and not yet adopted:

The law on information openness (adopted)

- Adopted on 29 October 1998
- Cabinet of Ministers Regulation No. 275 adopted on 3 August 1999

This law governs the way in which information at the disposal of national and local government institutions is to be made accessible to the public.

The law on the protection of personal data (adopted)

- Adopted on 23 March 2000
- Cabinet of Ministers Regulation No. 275 adopted on 3 August 1999
- The law has been adopted in accordance with EU directive 95/46/EC;
- It is also in accordance with the European Council's convention on personal data protection in relation to the automated processing of such data which was adopted on 28 January 1981.

A legal act on the legal protection of databases (adopted)

- These norms were adopted in accordance with EU directive 96/9/EC;
- The norms were adopted in relation to the law on copyright, which was adopted on 6 April 2000.

Cabinet of Ministers Regulation No. 106, 21 March 2000, "Regulations on the security of information systems" (adopted)

- Adopted in accordance with the Latvian criminal law of 17 June 1998.

Cabinet of Ministers Regulation No. 104, "Regulations on ensuring the establishment of a mega system" (adopted)

The law on national information systems (registers) (adopted)

- The Government elaborated Cabinet of Ministers regulations, "On the technical requirements of information systems", to replace the existing Regulation No. 70 of 1996, adopted on 2 May 2002.

Copyright Law

- New Copyright Law, adopted in 2000; acceding to the Berne Convention in 1995 and the Geneva Phonograms Convention in 1997; joining the World Trade Organisation (WTO) on 19 February 1999; and, acceding to both digital treaties, the WIPO Copyright Treaty (WCT) and the WIPO Performances and Phonogram Treaty (WPPT) on 22 March 2000.
- The history of the Latvian copyright reform began in 1993, when Latvia overhauled its old Soviet-style copyright law. After a series of revision efforts in 1998 and 1999, a new Copyright Law was enacted in April 2000, effective 27 April 2000 (with some provisions in force on 1 January 2001 and others on 1 January 2003). Latvia now has a relatively modern copyright law.
- Latvia has taken also legal and some structural action to improve its enforcement mechanism.
- Latvia passed a new Criminal Law in June 1998, which entered into force on 1 April 1999. Of the three provisions in these amendments, which relate to IPR protection (in particular Arts. 148-9), the Criminal Law now includes: fines for manufacturing, selling, storing or concealing unauthorised copies; confiscation of infringing copies and equipment; prison terms of up to three years for repeat offenders (including activities related to unauthorised decoders and smart cards); and up to five years in jail for organised crime activity. The fines range from between 60 and 160 times the minimum monthly salary. There are still no known plans to amend the Criminal Procedure Code.
-

The law on electronic documents and signatures (being drafted)

- The law is being drafted in accordance with EU directive 99/93/EC;
- The Cabinet of Ministers, on 4 January 2000, issued Instruction No. 1 on the establishment of a working group at the Ministry of Justice to deal with this issue.
- The draft law is in the process of adoption by the Parliament.

2.4.2 Telecommunication policy

Latvia is a signatory to the WTO's Basic Telecommunications Services Agreement consequent upon their accession to WTO in February 1999. Under the WTO obligation, competitive regulatory principles are expected to be in place by July 2001. International services are to be open for international competition by 1 January 2003. The basic telecommunications agreement has been ratified by the SAEIMA, the Latvian Parliament.

The Saeima adopted the 'Law on Telecommunications' in November 2001 valid until 2003, after which provisions of the European telecom policy would be appropriately incorporated. The law specifies directions towards liberalisation of telecom markets from 1 January 2003. It aims at promotion of telecommunications, services and establishment of new services; ensuring the protection of the interests of telecom service users, public telecoms network operators and service providers under the open market

economy conditions; and; promoting the accessibility of universal telecom services. The Law determines the rights, duties and liability of telecommunication service users, public telecommunication network operators, telecommunication service providers, private telecommunications network owners and state authorities in relation to the regulation of the telecommunications sector; the establishment, development and exploitation of telecommunications networks; the provision of telecommunications services, as well as the State control and supervision over the allocation and use of radio frequency spectrum, number and number range. The law is also applied to the public telecommunication network for distribution of television and audio programmes.

The institutional framework necessary for the development of the telecom sector has been evolving. A regulator was established, The Public Utilities Commission (PUC), which was a multi-sector regulator and an independent body. The PUC regulates the public services of telecommunications, posts, energy and railways based on the Law on Regulators of Public Services, on the statutes, as well as the strategy and basic principles of operation approved by the PUC Board. The Government also intends to develop and implement a new State strategy and policy in the telecommunication sector. The regulator will determine the conditions of operation and will formulate specific policies and rules for the implementation of these policies.

2.4.3 Co-ordinating bodies

Since the mid 1990s, when an active dialogue between IT &T business sector representatives and Government officials started in Latvia, several IT &T policy and activities co-ordinating bodies have been established. Among the most important are:

National Board of Information Society

This was established in April 2000 at the Cabinet of Ministers of Latvia. The Prime Minister of Latvia chairs the Board. The main duties of the Board are to co-ordinate and accept information society projects and programmes, e.g. e-Latvia, e-Commerce, e-Government etc.

Among the members of the National Board of Information Society are Government representatives (Ministers of Economy, Finances, Transport and Communications, Education, Culture), representatives from the Academic sector (National Library, Council of Universities, Council of Science, Council of Professional Education) and business sector representatives (Professional ICT associations, Association of SMEs, Latvian development Agency).

Co-ordination Board of the National Program "Informatics"

This was established in January 1999 at the Ministry of Transport and Communications of Latvia. The Minister of Transport and Communications of Latvia chairs the Board. Among the Board members are about 40 professionals, representing public, Academia and the private sector. At the moment, there are 12 representatives from the ICT business sector among the Board members.

The main functions of the Board are to initiate and evaluate ICT projects and investment in Latvia, as well as to initiate legislative acts and to establish state standards in the ICT field.

3. Present situation and trends in the country's information system

3.1 Availability of information

During the years of independence, Latvia has rapidly moved towards the information society. The number of mass media (newspapers, magazines, electronic and online media) has increased dramatically.

Libraries are becoming the major suppliers of all types of information (scientific/technical, financial/business, educational/reference etc.) across the country and in every community. The connection of all libraries to the unified information network, their interoperability with the national and international information systems and resources, and the development of an electronic and virtual library will ensure every opportunity to search and receive both local and global information at every library.

Information services are becoming available to remote users at work and at home.

Table 3.1. Availability of information

Number of public libraries per million population (excluding schools libraries), end 2000	432
Number of library users per million population (excluding schools libraries), end 2000	312, 000
Libraries with Internet connection as % of total number of libraries, end 2001	15%
Number of national and regional licensed radio broadcasting programmes, end 2001	37
Number of national and regional licensed TV broadcasting programmes, end 2001	29
Number of licensed cable TV broadcasters, end 2001	37
Daily newspapers per capita, 2000	76

An effective electronic mass media system provides comprehensive and objective information to the society and the whole country. Balanced development of, and competition between, public and private radio and TV systems are managed in a way that avoid a direct influence of political and economic authorities on public opinion. Transmission of digital TV began at the start of 2002.

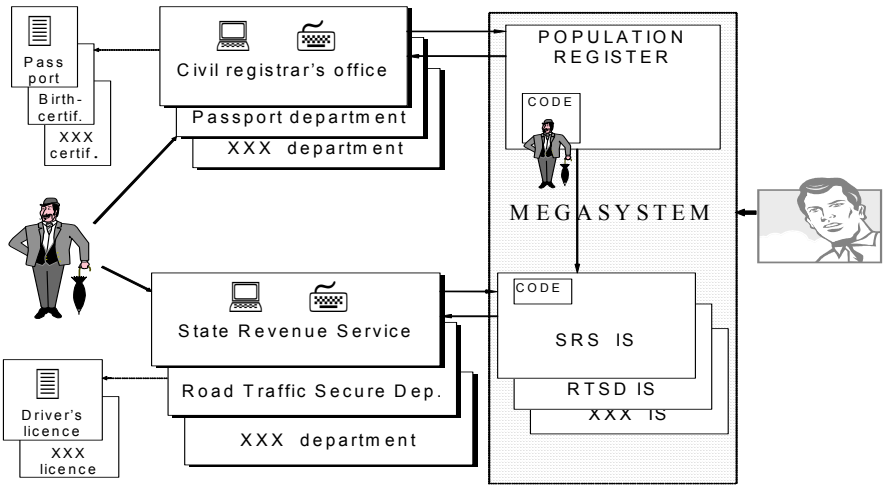
A large proportion of all important information from the public and the private sector and from the mass media is now available online.

3.2 Public information processing and services

Public sector information ranks high among various types of information by its amount and significance. The public sector is producing and collecting vast quantities of data in Latvia and it is the most important (and very often only) collector and producer of information content. The private sector is active in provision of value added business information that is also based in large measure on public sector information. Ensuring access to well-developed information services for everyone is envisaged as a tool of democratic development and successful functioning of the country and society.

A logically unified and technologically distributed information processing mega-system with a common data field, as well as unified user's interface and access principles, are being developed in Latvia to integrate the whole set of public information systems, to provide their interoperability and interchange of data. All end-systems (various information systems, their remote data entry and access points, end-users of information) are being interconnected through a high-speed data communications network. The unified mega-system will be extended to all regional and rural administrative centres, and to any community.

Figure 3.1. The mega-system; data flows



This means that basic data entry and utilisation procedures are shifted to the places from which the information has originated or where it was exploited. This avoids duplication of records and the confusion of records in documents and databases. A central core of the mega-system provides information exchange among various information systems, meta-data on all components of the mega-system, a united and user-friendly access to information, including the handling of requests that require processing data from various components. The mega-system is in the process of becoming interconnected with a national portal, thus ensuring a real base for the development of all e-governance functions.

Creation of the mega-system is not only a technological decision, in fact, it is, first of all, a means of solving various informative, legal, and organisational problems.

The number and the informational value of various kinds of local information sources are increasing rapidly, more than 60% of the total Internet traffic is within the Latvian borders nowadays. Moreover, the outgoing traffic from Latvia is increasing rapidly. Our information is becoming more and more attractive for the international community.

All principles of the mega-system are therefore being developed to allow for integration of Latvia's information systems into the Transeuropean corporate telematic networks (EBR, EuCaris, Eurostat, etc.). International expansion of the mega-system involves the creation of interfaces for international interconnections, while maintaining the basic principles of the mega-system. Such an approach corresponds to the fundamental principles of the IDA Programme. It is the basis for successful participation of Latvia in the Programme.

The Enterprise Register has been joined to the European Business Register in order to support international financial relations and investment processes, as well as business cooperation and foreign trade. The Vehicles Register has already been connected to the European Car Register. A number of other national information systems are already participating in the activities of international systems.

3.3 Development of State Information Systems

In accordance with the National Program on Informatics and the E-Latvia programme, a great deal of effort and investment have been used to develop state information systems. Development of state systems in Latvia is closely linked with modernisation of the telecommunications infrastructure including the establishment of Internet services and the liberalisation of the telecom market from January 2003. It is proposed that LVL 80 millions (US$ 120 million)be invested in the creation of an appropriate infrastructure for meeting the requirements of the EU.

There were 29 State information system projects implemented in 2001, and 24 of them were to be continued in 2002. The creation of technical security, control and information systems at the border; an information system of State revenue and customs policy; and the creation of an information system of education in Latvia were the major projects initiated.

The creation of a registers programme included: a Population Register; an Enterprise Register; a Taxpayers Register; a Cadastral Register; and an information system of the Road Traffic Safety Directorate. Information about other information systems developed in Latvia and included in the mega-system and other data subjects stored in these systems, will be aggregated in the Register Registry.

At the end of 2001, the Cabinet of Ministers of Latvia accepted an 'Instruction on the State Sector Information Available Online.' These regulations constitute a major step forward to make the State information transparent and available online to citizens and businesses.

The Instruction takes care of the State organisations' (Ministries, State agencies, State services) web page content, technical requirements, security issues, as well as of the sets of standards of interactive communication with clients such as documents available online, downloadable forms, requests and answers on online, etc.

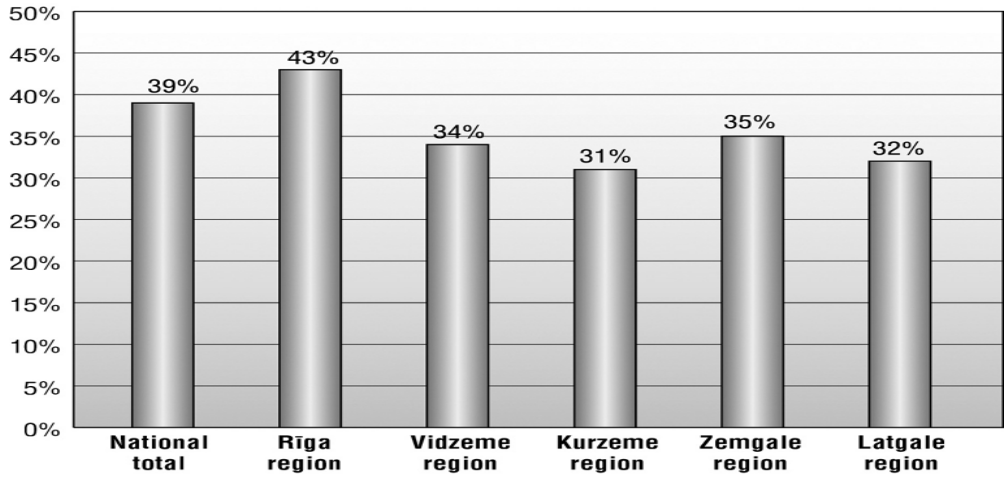
3.4 Computerisation of Latvia's private sector

The Central Statistical Board has conducted a study of the level of computerisation of Latvian companies as of the end of 2002. Specialists looked at how many computers companies had, what kind of computers they were, whether there were local area connections and Internet connections, whether the companies had their own web pages, etc. Level of IT use has, since the time of the study, increased.
Data from the study were correlated on the basis of two indicators: the location of companies; and the area of business they were involved in. The location of companies was determined on the basis of their legal address, not on their actual location, which means that the computers of a Rīga company's branch office in a rural town were seen as being in Rīga, not in the other municipality. The study surveyed all companies in Latvia with more than 50 employees or with an annual turnover of more than Ls 300,000. Researchers also surveyed Government institutions, government-funded institutions, and a sample of small companies (i.e. the survey covered all large companies and Government institutions, but only some small companies). Of Latvia's 40,000 companies, 12,000 were surveyed. These firms were located in all parts of the country, and they were engaged in all kinds of activities (including national administration).

It was found that 39% of Latvia's companies owned computers. Among large companies, the percentage was 76%, while among small firms it was 27%. Companies in and around Rīga had the highest level of computerisation with 43% of all companies using computers. The lowest percentages were found in the western region of Kurseme (31%) and the eastern region of Latgale (32%). There were also differences between companies in the country's major cities and those in other areas. For example, 42% of the enterprises in Latvia's seven largest cities had computers, compared with only 33% of the companies in other regions.

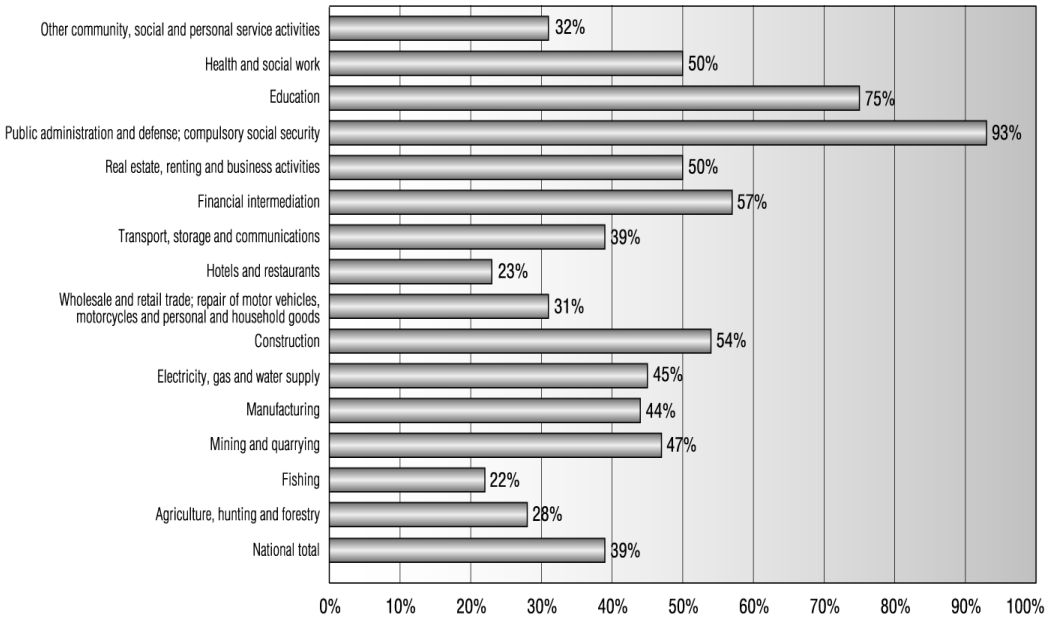
Among the computerised companies, 41% had only one computer, while 13% had more than 10. This was largely due to the fact that the majority of the companies in Latvia have just a few employees.

Figure 3.2. The level of computerisation at companies in Latvia's regions



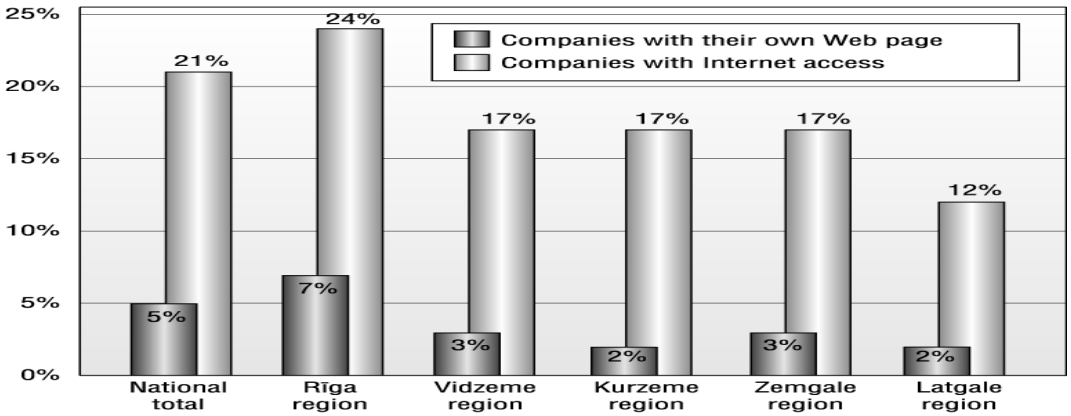
The level of computerisation of various sectors of the economy differs considerably. The level was greatest in the Government and defence institutions (93% of them have computers). The level was lowest among the companies, which provide individual services such as hairdressing salons, saunas, solariums, etc (12%, on the average). Wholesalers had more computers than retailers (54% vs. 19%). More detailed information (in accordance with the NACE classification) can be found in Figure 3.3.

Figure 3.3. The level of computerisation at companies of different industrial sectors



A total of 5,300 companies, or 53% of enterprises with a computer, had an Internet connection at the time of the survey, while 2,000 enterprises (5% of all companies and 13% of the computerised companies) had their own Internet homepage. Internet connections were most common among the companies engaged in postal or communications services (80%), IT companies (78%), public organisations of various kinds (76%), and financial services companies (74%). Of all Internet-connected computers, 59% had a permanent connection at a speed of 256 Kbps or more, 27% had a permanent connection with a speed up to 128 Kbps, and 15% used dial-up access.

Figure 3.4. Latvian companies and the Internet



3.5 Information services in the private sector

The availability of information systems has increased dramatically in the private sector. The most active industries that have set up online information include: banks; communications companies; public utilities; trading companies and mass media.
Currently, all leading Latvian banks provide online services to their clients For example, Hansa Banka, one of the leading Latvian banks, successfully managed to link initial measures of identification of customers with solutions of the transaction authorisation. Thus, following the authorisation or registration of the customer, the bank can confirm to the third parties in the online regime that a particular service is requested by a concrete and identified person.

In this way, persons have access in the online regime to several public registers: to the Resident Register (the largest public register); the Enterprise Register and the Central Depositary. In these registers, individuals can discover what data has been registered on him/her by the State and, where necessary, they can inform public registers about detected shortcomings or errors, all free of charge. In the near future, "Hansabanka" has planned to connect even more public registers, including the registers of the Road Traffic Safety Directorate and the Land Register.

The corporate sector in Latvia is now re-engineering its adaptation process, utilising the experiences and practices followed by their counterparts in Europe and other Western countries. Many companies are implementing enterprise resource planning, including SAP/R3 and Navision. Some companies are adopting CRM solutions to enhance their reach and market coverage. ICTs are considered an essential tool for improving productivity and competitiveness of Latvian enterprises. To enhance the penetration of IT, the government is preparing a law to allow corporations to charge the cost of computer systems over the period of three years as depreciation. For individuals, appropriate allowances have been established to stimulate the use of ICTs.

3.6 Computer software piracy

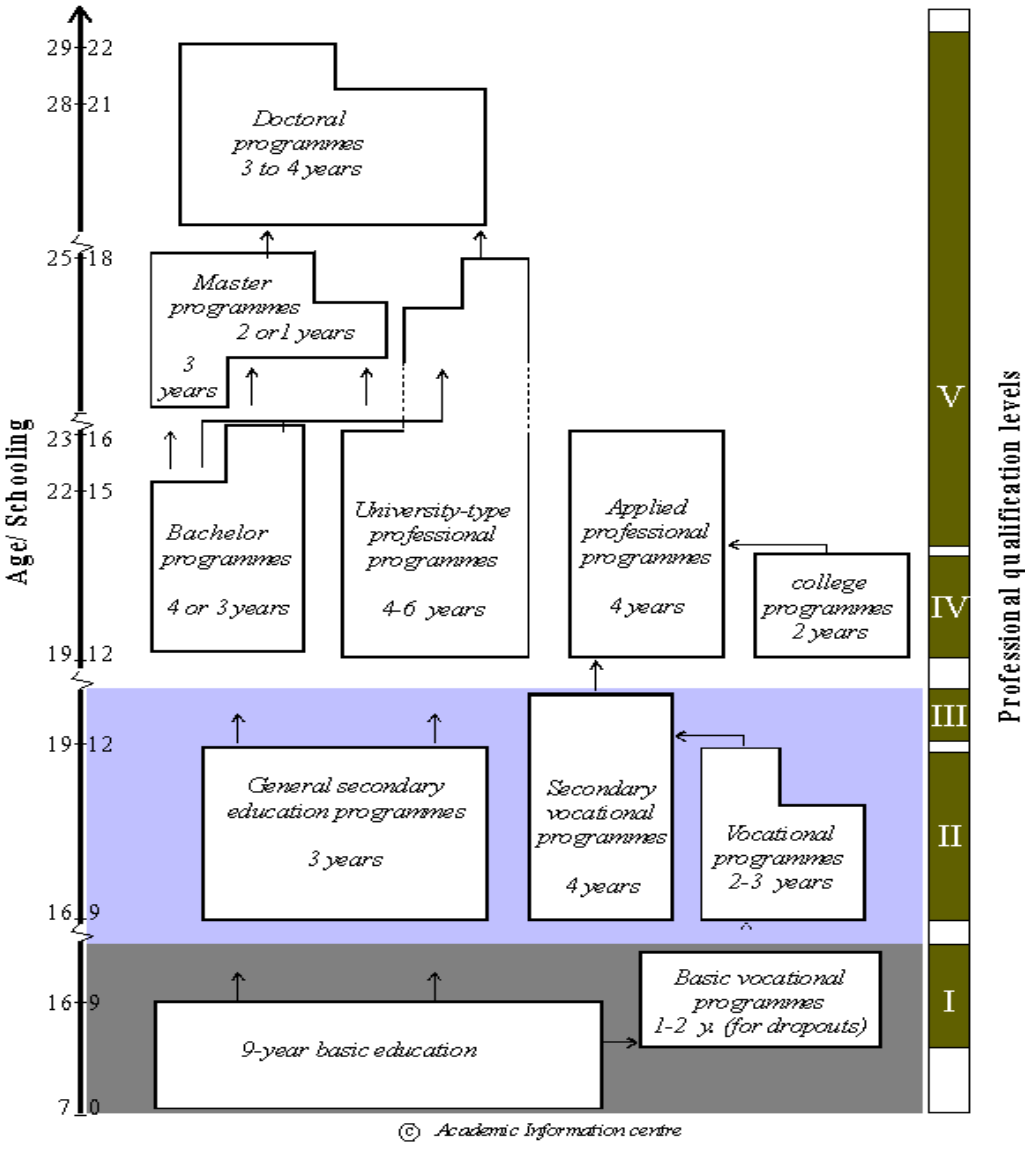
According to the latest survey of the Business Software Alliance, the level of computer software piracy in Latvia at the beginning of 2002 was estimated as 59%. It was 76% in 2001 and 85% in 2000. The Government recently announced that piracy had come down to a level of 52% by August 2002. The decrease of the rate of computer piracy by 23 percentage points during the year is primarily attributed to the fact that new computers have been purchased with licensed software already installed. Besides, companies tend to pay more attention to the origin of software installed in their computers, as they do not want to deal with the Latvian BSA Committee. It has been observed that the level of software piracy is still quite high. Losses caused by the piracy of computer software in 2001 were estimated to be US$ 10 million.

4. Characteristics of the Country's Human Resources

4.1 Main trends and facts in Latvia's HR

The creation of a society receptive to innovation has been set as one of the key priorities of Latvian economic and social policy. It is accepted that the quality of the country's education system plays a crucial role in the development of a knowledge-based economy. All levels of education are important and are priority areas in Latvia, beginning with the preliminary education, vocational and professional education, as well as higher education and so called 'life-long learning".

Figure 4.1. Main types and levels of education system in Latvia



Source: Ministry of Education and Science

The Ministry of Education and Science (MoES) is responsible for the development of education and science policy in Latvia. Most of the educational establishments are under its supervision (except for private schools and universities, as well as several vocational schools that are supervised by other line ministries or municipalities). The general educational trend in Latvia is an increase in the number of people acquiring education or improving their qualifications. In 2001, just as in the preceding years, the number of students continued to increase rapidly. In academic year 2001 / 2002, there were 110,500 people, studying at both the State-owned and private higher education establishments. There are 453 students per 10,000 inhabitants in Latvia which is one of the highest rates if compared with other European countries.

The number of people that have acquired degrees or qualifications has also increased quite impressively in recent years. In 2002, it reached 20,308.

Taking into account the increasing number of students, the introduction of the Study Crediting System in 2001 has to be considered as an important step towards the perfection of the higher education system in Latvia.

The optimisation of the number of specialists financed by the State according to the study areas continues. Taking into account the increasing demand for specialists in the ICT sector, the number of students receiving public support has been increased for this sector, simultaneously reducing places in Social Sciences and Pedagogy. It is planned to continue this policy over the next three to four years.

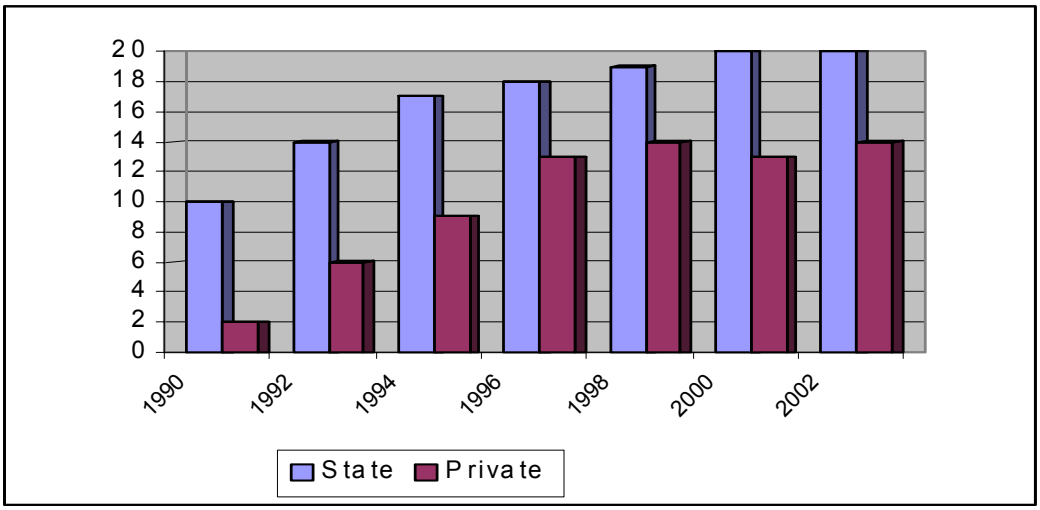
Table 4.1. presents some basic indicators of higher education in Latvia (academic year 2000 / 2002)

Table 4.1.

Total amount of students	110,500
Number of 1st year students	29,332
Number of students per 10,000 inhabitants	453
Number of academic personnel	3,236
Share of professors within the academic personnel	22 %
Share of students within population 18-23 years old	29.2%
Number of doctoral programme students	1,301
Number of R&D personnel in University level establishments	1,752
Number of acquired degrees or qualifications (total)	20,308
Including:	
Bachelor degree	9,139 (45%)
Professional qualification	7,797 (38%)
Master degree	3,335 (17%)
Doctor degree	37 (0.2%)
Share of state budget expenditures for education within GDP	7%
Share of state budget expenditures for higher education within GDP	1.5%

In the beginning of 2002, there were 34 higher education establishments operating in Latvia, 20 of them were State-owned and 14 private. The chart below illustrates the change in the number of universities since 1990.

Figure 4.2. University level institutions in Latvia (1990 – 2002), Source – Ministry of Education and Science)

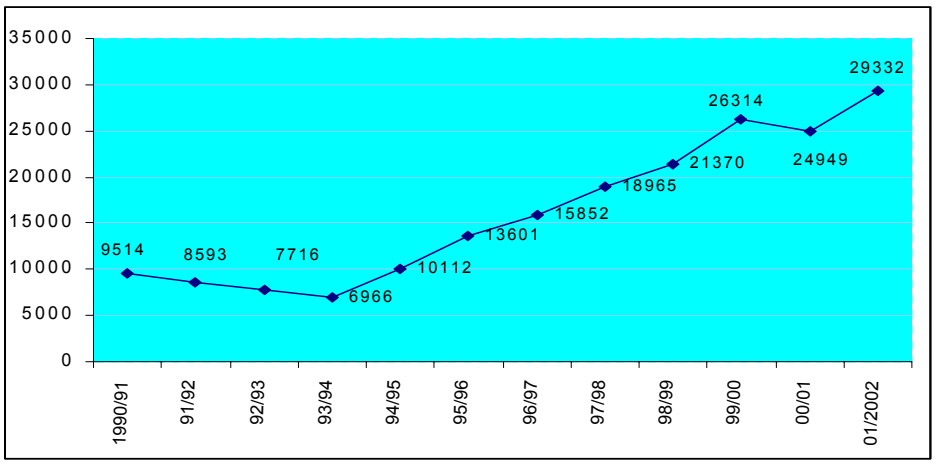


Source – Ministry of Education and Science

The number of first year students continues to grow at the average annual rate of 18%. The greatest increase is in private universities where the number of first year students increased by 62% in academic year 2001 / 2002. Significant increases in first year students also took place at the regional universities, namely Ventspils University and Vidseme University, where the increase was respectively 41% and 47%.

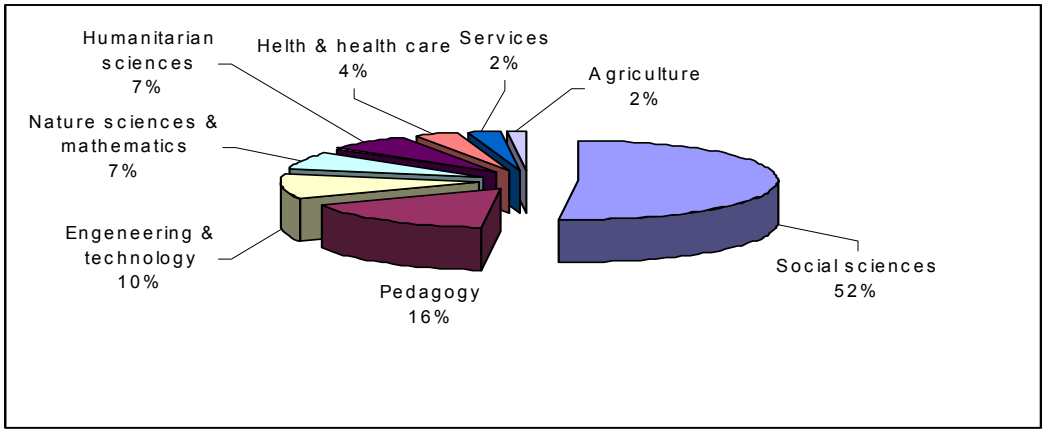
The chart below shows the number of first year students in Latvia (academic years 1990/91 – 2001/02)

Figure 4.3. Number of first year students in Latvia (Source: Ministry of Education and Science



The distribution of students according to study programmes has not changed much in the last few years. The most popular are still the Social Sciences (see Figure 4.4.).

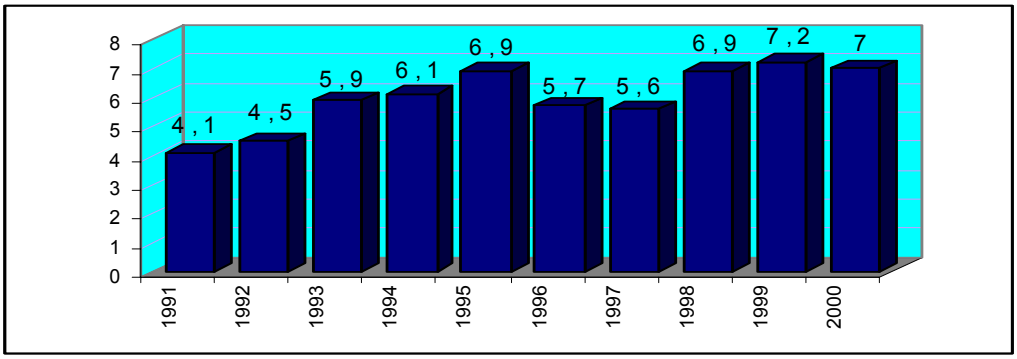
Figure 4.4. Distribution of students according to study programmes (academic year 2001 / 2002



Source: Ministry of Education and Science

As education is one of the priorities in Latvia, the financing of education has also grown over the last decade (see chart below).

Figure 4.5. Share of GDP allocated for education in Latvia (1990 – 2000)



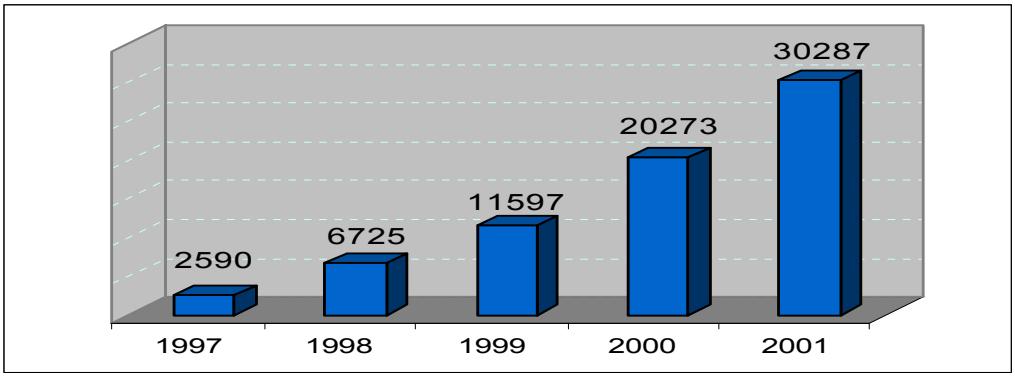
Source: Ministry of Education and Science

As the annual study fees are gradually increasing along with the number of students who have to pay for their studies, a student crediting system is becoming an increasingly important element of the higher education system. Such a system was introduced in 1997 in Latvia. Along with determining a number of the publicly financed study places in different specialities, the crediting system also serves as an instrument to influence the study-subject structure of students in order to meet the requirements of the national economy. There are two types of credits available:

- Those for financing the study fees charged by private universities or those for students entering State universities who were unable to beat the competition for budget financed places;
- Credits for covering the living and social needs of students.

The study credits are issued on preferential conditions and have to be returned gradually after completion of the studies.

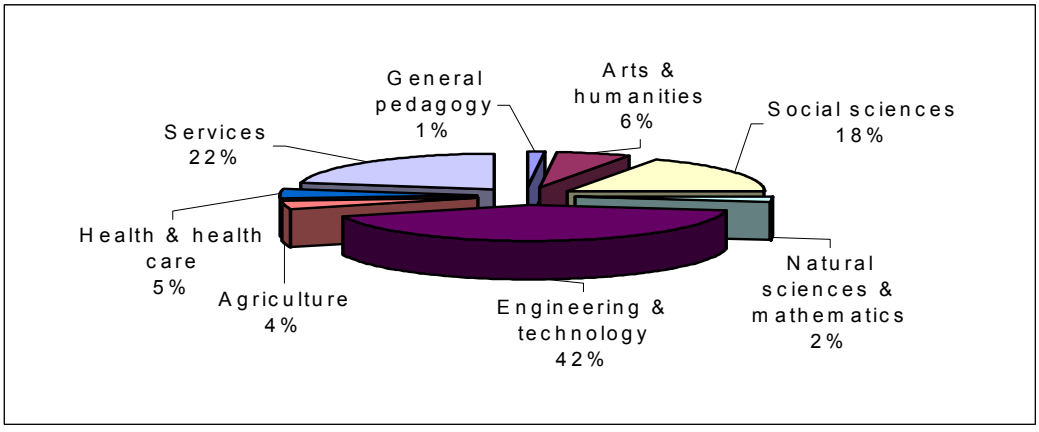
Figure 4.7. Number of study credits issued pr annum



Source: Ministry of Education and Science

Besides higher education, other levels of education are important as well, vocational education being one of them. In 2001, there were 121 vocational education establishments operating in Latvia with 48,625 students and 5,439 pedagogical staff. The chart below illustrates the structure of vocational education in Latvia according to the study programmes.

Figure 4.8. Structure of vocational education)



Source: Ministry of Education and Science

4.2 Human resources and education in Latvia's ICT sector.

Secondary education

Nearly all of Latvia's schools have computers, but the city of Riga does better in this aspect as nearly all schools have at least 15 computers. Under the auspices of the Latvian Education Informatisation Project, Latvia's schools received 2,700 modern computers with multimedia functions in 1999. The project (known as LIIS in the Latvian acronym) provides for the establishment of an appropriate school infrastructure, making use of computerised teaching materials and informatising the management of the educational system. Regional school computer centres have been set up in all of the country's districts, and they serve as support facilities for the informatisation of local schools and for the training of teachers.

Schools have received a great many computers and software licenses, and several hundred teachers have taken computer-training courses. Lots of educational materials have been developed and posted on the Internet. Sadly, many of these materials are simple texts, with no multimedia aspects or other benefits of the new technologies. The State and the local Governments of Latvia finance the LIIS project, and the total investment has reached the level of Ls 6.3 million.

Since 1998, under the auspices of the LIIS project, 70% of Latvia's teachers have undergone ICT training. In 2001, the programme was merged with the European Computer Driving License, taking the particular needs of teachers into account. A total of 190 informatics teachers received in-depth training on the presentation of computer classes, the administration of servers and the maintenance of databases. Another 300 continuing education teachers received training by the end of 2000.

Within the agreement between the University of Latvia and the Centre for Educational Content and Examination in April 2002, changes in the 4th, 5th and 6th grades of Latvia's schools will be implemented by the end of the 2004/2005 school year so as to introduce the use of EDS modules. Furthermore, students who take general or specialised courses in the exact sciences in the 11th and 12th grade will spend two hours a week in in-depth studies of information technologies.

Latvia's schools have become involved in the international I*LEARN project, which involves schools from 48 countries. Students and schools from various countries engage in distance discussions via E-mail, the web, chat services, etc. Students from 20 schools in Latvia have become involved in an international exchange of ideas and cooperation, which helps them to study, to learn foreign languages and to learn about different cultures. The Latvian School Technology Exposition (LatSTE) was launched in 1998. It's an annual event to promote an exchange of experiences among schoolteachers, local government employees and university instructors.

IT companies have also supported the informatisation of schools. Under the auspices of a project called "Contemporary Odyssey", 30 Latvian schools have received used computers that can be used in the educational process, along with software and a free one-year Internet connection.

Home computers are usually bought for the needs of children and adolescents and their education, according to a study done among first-year students at the University of Latvia, 43% of respondents said that their family has a computer. Nearly one-half of respondents have an E-mail address. At the same time, however, relatively few schools allow their students to use the Internet and nearly half of the surveyed high school graduates had no Internet skills.

In 2001, a study was done on the attitude of students in grades 5-12 with respect to information technologies and their use at schools. There were 1,690 respondents, of whom 94.5% said that ICT training is available at their schools. 62% of respondents had access to Internet connections, but 64.8% of students were not learning about use of the Internet at school. The Internet is used most often to seek out information for study topics or projects. Two-thirds of the students said that they are very interested in learning about ICT, and several ICT companies are offering free training for students at summer computer camps, which are led by specialists. In 2002, the company Exigen Latvia designed a course called "Introduction to HTML". Students, who take the course gain basic knowledge about the design of a school homepage.

ICT Higher Education

The Latvian government has announced education in ICTs as a priority since 2001. As a result, an increase of about 17 % of state budget funded students studying towards their first degree was recorded, with an increase of 34% of privately funded students at the same level.

Ten professional secondary education institutions in Latvia train specialists for the ICT sector. A higher education qualification can be obtained from the University of Latvia, the Riga Technical University and the Institute of Transport and Communications, for the most part. Few specialists are trained by regional Universities: in Rēsekne, Ventspils, Liepāja and Valmiera. The Riga International School of Economics and Business Administration has launched a course in E-commerce. High school graduates have a great deal of interest in computer studies, and increasing numbers of graduates are seeking to enter ICT programmes in universities.

There are, however, some problems, regarding ICT training. Many students, specialising in ICTs go, in their first few years of studies, to work at companies, causing them to miss classes. Another important issue is that a large number of students drop out of school during their studies. The number of people, who graduated from ICT programmes in 2001, was equal to just 29% of those, who enrolled in that year. There were just 757 graduates from the nation's university.

Table.4.2. ICTE students (at 9 institutions of higher education)

	Enrolled in 2000: state financing/ private financing	Enrolled in 2001: state financing/ private financing	Graduated in 2000	Graduated in 2001
Riga Technical University				

Studying towards first diploma :	611/154	564/180	332	300
Total:	1017/211	1003/290	456	486
University of Latvia				
Studying towards first diploma :	76/56	138/123	45	53
Total:	122/91	183/149	75	88
Transport and Telecommunications Institute				
Studying towards first diploma :	0/323	0/400	112	76
Total:	0/403	0/453	137	108
Daugavpils University				
Studying towards first diploma :	38/4	50/15	34	22
Total:	38/4	50/15	34	22
Liepaja Pedagogy Academy				
Studying towards first diploma :	28/33	50/12	15	34
Total:	28/33	50/12	15	34
Latvian Agriculture University				
Studying towards first diploma :	25/36	50/46	-	-
Total:	25/36	50/46	-	-
Resekne University College				
Studying towards first diploma :	27/19	25/29	14	19
Total:	27/19	25/29	14	19
Vidseme University College				
Studying towards first diploma :	-	13/17	-	-
Total:	-	13/17	-	-
Riga Technical College				
Studying towards first diploma :	25/0	50/0	-	-
Total:	25/0	50/0	-	-
Totally in Latvia				
Studying towards first diploma:	830/625	990/837	552	516
Total:	1236/797	1432/1011	697	757

Source: Ministry of Education, January 2002

Since 1996, a number of companies have provided scholarships to students, supporting annual papers and competition projects for bachelors and master's degree, as well as engineering students in Computer Science and Informatics. Support is also given to the publishing of books, including an English-Latvian-Russian dictionary called "Personal Computers".

In 2002, the University of Latvia, the Riga Technical University, the Riga Stradiņš University and the Latvian Agricultural University signed a protocol of intent with the Ministry of Economy, the Ministry of Education and Science, the Latvian Development Agency and the Riga Regional Development Agency on cooperation in the establishment of a science and technology park. The project seeks to establish science and technology centres as a cornerstone for the development of high-tech companies, innovative operations, new infrastructure and the commercialisation of new ideas through the introduction of new products and services.

Cooperation between employers and universities

In 2000, a professional education council was set up for the IT&T and electronics industries in Latvia. The council was established by the ITTE Alliance, which at that time included the Latvian Association of Electronics and Electro-Technical Industries (LETERA), the Latvian Association of Information Technologies and Telecommunications (LITTA), the Latvian Association of Computer Technologies (LDTA) and the Latvian Telecommunications Association (LTA). The council was charged with approving professional standards for the sector, promoting the development of new standards and the renewal of existing ones, and with providing assessments of professional educational programmes in Latvia. Under the auspices of the EU PHARE Program "Professional Education 2000" project, standards for software designers, system analysts and computer system administrators were prepared. In 2002, there are plans to elaborate standards for software testers and software program managers. Each of these standards makes reference to job market demands in the relevant area, thus serving as an instrument, which allows the job market to correlate the overall and specific demands of the sector in relation to a group of workers. These demands can then be made known to educators.

In November 2001, an agreement was reached on educational cooperation among companies, which are part of the information system cluster, the Riga Technical University and the University of Latvia, with the aim to train new specialists and to update the skills of existing specialists in line with the shifting demands of the job market. Several companies are offering courses and seminars at their own facilities, focusing on areas of activity, in which the enterprises have special expertise. Company employees are also going to work as educators in the country's Universities. Increasing numbers of companies are offering internships and trainers for emerging specialists.

On-going education in the IT sector

The only institution in Latvia, which represents the international certification organisation Virtual University Enterprises (VUE) in terms of ProMetrics and Computer Adaptive Technologies, is the Baltic Computer Academy (www.bda.lv). The academy allows students to take all of the world's most popular certification tests.

Some suppliers of the tests have regional price policies. These include Microsoft, Novell and IBM.

Several employers use the Brainbench testing service, which allows for a check of Internet related knowledge and skills. The Brainbench tests are useful in terms of checking one's own knowledge, as well as of receiving official confirmation.

Specialised bookstores contain lots of literature on certification programmes. Several companies are establishing an environment in which employees are provided with books and multimedia materials for self-training needs. Companies have libraries and collections of resources in this area.

A company called Informācijas Tehnoloģijas offers an Oracle-certified training in Latvian. The company DataPro in 2001 signed a contract with Sun Microsystems on Java training. The most popular courses are the Java TM Programming Language course.

The Baltic Computer Academy offers certified training programmes in relation to Microsoft, Lotus, Tivoli, Informix, AIX, Novell, CIW, Compaq and Hewlett-Packard programmes. Internationally-certified instructors teach these courses. The most popular programmes are those related to computer network maintenance and administration. The Academy carefully analyses trends in the ICT market, preparing instructors for new technology courses on an ongoing basis. Recently, there has been a surge of interest in software designer certification, and this suggests that various software projects in the areas, such as the web, user solutions and database management, are currently being pursued. ICT courses in Latvia are four or five times less expensive than in the West, even though the same training materials and certification tests are being used. The instructors in both localities have the same qualifications.

Project management qualifications have much to do with the ability of companies to design software that is in line with international standards. Managers at several companies are close to obtaining a Professional Management Professional degree from the Project Management Institute (www.pmi.org).

Since 2001, the information systems cluster has studied training needs and planned training programmes that are of particular use to small businesses. Project management courses offer not just theoretical skills, but also knowledge of ICT project planning, supervision and control. A total of 40 project managers were trained in 2001.

In 2002, a project was elaborated to set up an infrastructure for a post-diploma professional education centre at the Institute of Mathematics and Informatics of the University of Latvia. At least 30 training courses are to be developed on such subjects as: Windows Application Development; Object Oriented Technologies; Database Technologies; Network and Operating System Technologies; Web/IP Technologies; etc. Distance education opportunities will also be used. The project hopes to receive financing from the PHARE Program's Economic and Social Cohesion Fund for this purpose. Work is being done on drafting a technical and economic plan.

Representatives from the information systems cluster are actively participating in the Nordic E-dimension Initiative. The Nordic E-dimension Action Plan (NeDAP) was

agreed at the meeting of the Informatics Ministers from the region in September 2001. The plan was to launch joint projects which will be in line with the interests of the countries that are involved, taking advantage of their historical experience, traditions and strengths. There will be cooperation among Universities and research institutions. The goal of the E-skills Initiative is to develop ICT skills at various levels of studies and to identify opportunities to develop training centres in the Northwest of the Russian Federation and the EU's candidate countries. The Riga Technical University has already become involved in the Baltic Sea Virtual Campus project.

European Computer Driver License (ECDL)

ECDL was implemented in 2001, as a result of the joint efforts of the Latvian Information Technology and Telecommunications Association (LITTA), Swedish Computer Society (DFS), Swedish company Lexicon, Riga Information Technology Institute, and University of Latvia. A successful pilot project resulted in award of the first 41 ECDL certificates. It is expected to reach a thousand ECDL awarded by 2002.

New Opportunities

People with disabilities have new distance work opportunities through the development of the information society in Latvia. They can work on computer processing, computer design, software development and other information processing work without leaving their homes.

In 1999, a project called "Friendly Support from the Computer" was implemented with the financing of the Soros Foundation of Latvia. The project allowed hundreds of adults and children with physical disabilities to use computers, Internet connections and relevant training. People who have limited communication and movement abilities or who have problems in leaving their homes (differently able people, parents with small children, educated people in rural areas, etc.), can have the same work and education opportunities as others, and so an increased attention is being devoted to distance work and ongoing education.

In March 2002, the public fund "Open Latvia" launched a European Union's 5th Framework Program, "THINK" (Towards Handicap Integration Negotiating Knowledge), which helps differently able people to become integrated into the job market. The goal of the THINK project is to allow these people to use the advantages of ICT irrespective of their place of residence. The introduction of this new model into the job market will allow 20 differently able people to enjoy workstations with all of the necessary computer equipment and communications.

5. National innovation capacities and capabilities and their effectiveness

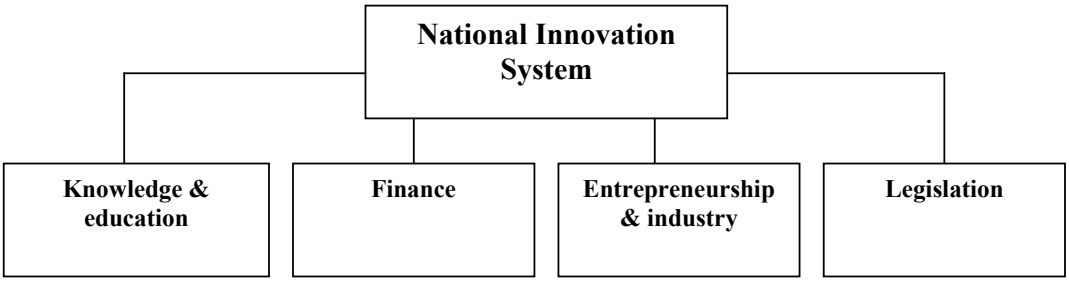
5.1 Innovation strategy and main tasks

Innovation is one of the main priorities of Latvian economic policy. Following the National Concept of Innovation, which was approved by the Cabinet of Ministers on 27 February 2001, the National Innovation Programme and its action plan are now being developed and are expected to be approved by the end of 2002. The main directions of the program will be:

- formation of a society open to innovation;
- development of an innovation policy which is co-ordinated with the EU member states;
- legal acts and other regulatory documents favourable to innovative business activity;
- support for the establishment and further growth of innovative enterprises;
- efficient co-ordination of all aspects of the innovation system.

There are four main components of the National Innovation System that will be addressed by the National Programme on Innovation (see figure 5.1.).

Figure 5.1. Elements of National Innovation system



5.2 Innovation support institutions

There are various support institutions set up in Latvia with the task of supporting emerging innovative enterprises. These organisations may be classified as follows:

- **a Business Incubator** (BI) is a structure, which can offer services and support to every kind of business in every industry branch by leasing rooms and providing technical and secretarial services. The basic function of the BI is to promote the start-up of new enterprises and provide them with information on different legislative acts and to offer consultations on marketing, company management, finances, and other aspects of business;

- **a Technological / Innovation Centre** (TC) is a structure, which can offer services and support mainly to technology-oriented (knowledge-based) enterprises. Basically, a TC has four functions: the same as for the business incubator; specialised consultations and information to technology-oriented businesses; support for participation in exhibitions and cooperative international initiatives,

as well as advertising new products, etc.; and advisory services for getting loans and other kind of financial support;

- **a Technology Transfer Centre** (TT) is a structure to promote the development and production of technology-based products by transferring the knowledge and research results from research institutions and laboratories to industry, including technology-oriented SMEs;

- **a Science / Technology Park** (TP) is a defined area of land and a complex of several buildings to be used for knowledge / technology based research, development and production. In the TP there can be located a number of higher educational and research institutes, technological / innovation centres, business incubators, consultant bureaus, service centres, etc. The basic function of a TP is to manage this area and buildings for the efficient development of high-tech business and to provide permanent links between research laboratories and technology-oriented companies and to promote the establishment and growth of new innovative companies, including joint venture companies. Usually the TP are established near universities or research centres. For TP tenant companies it is possible to receive certain fiscal and economic privileges.

On 18 September 1996, the Latvian Association of Technological Parks, Centres and Business Incubators (LTICA) was established to unite several innovation support institutions. The main objectives of LTICA are:

- to create permanent links among all the business support structures in Latvia;
- to raise the qualification of the members of the LTICA;
- to represent and protect the interests of its members at various governmental and non-governmental institutions and organisations;
- to create an information network to support technology-oriented SMEs;
- to promote the establishment of new business support structures;
- to support technology transfer and innovation;
- to create contacts and participate in various international and regional associations;
- to cooperate with self-governmental and local authorities, science and research centres;
- to publicise the LTICA and the activities of its member, etc.

Following is information about some of the innovation support institutions in Latvia including their profiles.

Latvian Technology Centre (LTC)

LTC is a classic form of technological or business and innovation centre. It was established in 1993 as a “testing ground” for the development of innovation and technology oriented SME support structures in Latvia. By its legal status, the LTC is a non-profit limited liability (Ltd) company initiated and financed by public organisations, namely Ministries and municipalities.

Since 1997, LTC has been a contractor of the EC project in the framework of the INCO-COPERNICUS program. The goal of this project was to create the innovation support and information unit IRC-LATVIA (Innovation Relay Centre) in Latvia.

Since January 1999, LTC has been acting as a National Contact Point and the Latvian representative in the EC Programme Committee for the horizontal program "Promotion of Innovation and Encouragement of Participation of Small and Medium-Sized Enterprises" in the 5th Framework Programme of the European Union.

The main objectives of LTC are:

- to facilitate co-operation between science and industry;
- to support the establishment of technological and knowledge based SMEs;
- to create permanent contacts between scientific laboratories and industry;
- to facilitate international co-operation of technology oriented SMEs and to create new work places for qualified specialists and scientists

LTC offers the following main services:

- rent of premises for offices and small production units;
- office services;
- advice and consultations on enterprise management and marketing;
- advice on attracting investment and elaboration of development plans.

Latvia Technology Park

Latvia Technology Park (LTP) was founded on 23 January 1996, with the aim of promoting commercialisation of science through modern technologies by developing and supporting small and medium-size production companies.

The Business Innovation Centre of LTP (LTP BIC) is one of the main parts of the LTP structure. The Centre constantly provides manufacturers, scientific institutes, industrial enterprises and other local or international institutions and organisations with information about participation opportunities in different projects. The Centre helps issue business plans, finds partners abroad (and vice versa), offers consultancy in protection and evaluation of intellectual property.

LTP BIC works together with technology managers in the University of Latvia (the Institute of Solid State Physics), Riga Aviation University, Riga Technical University, Latvian University of Agriculture and the Business Incubator of LTP.

LTP, in cooperation with the Swedish firm Reglertekniska Ingenjorsburan AB (RIB) and Riga Technical University, has established a Process Control Training Centre. The Centre offers training courses in process control and industrial measurements. Five-day training courses are developed for technical specialists from manufacturing enterprises to improve their qualification in the use of advanced microprocessor control and measurements. Programmes and schedules of the courses are worked out together with the RIB, which also produces modern laboratory standards in process control.

The main services offered by the LTP include:

- promotion of innovation - within the LTP, measures are undertaken to favour innovative activities. International services and other consultations are available

at the LTP. The LTP organises forums of enterprises, seminars on exchanges of technology, festivals with the participation of leading and prospective entrepreneurs;
- transfer of technologies;
- leasing - the LTP rents out premises for enterprises with very different needs. It is possible for the LTP to rent out premises, starting from a small office space of 15 m2 up to a small technologically-oriented industrial enterprise of 500 m2. A large land area with convenient parking places and green zones has been placed at the disposal of the LTP. The enterprises can use separate heated and unheated warehouses. The LTP has premises for meetings, training and conferences with general-purpose furniture and specialised equipment;
- office and other operational services rendered to enterprises - within the LTP, a wide range of services are rendered to the park's enterprises and others, ranging from office and secretarial services up to complicated technological and legal consultations. These services are rendered by the personnel of the LTP. Depending on the need and economical justification, other consultants, firms or persons, are involved or invited.

The basic services of the incubator:
- telecommunications: Phone; Fax.;
- data communication: LAN; Internet;
- office service: Copying; Mailing service; Secretary; Office supply;
- restaurant service: catering;
- basic information service: Basic business literature and newspapers;
- BIC information service:
    - EU data base and literature;
    - Latvian data base and business literature;
    - ICECE, IASP data bases and news;
    - International networks.

Business Innovation Centre of Latvian Electronic Industry

The Business Innovation Centre of the Latvian Electronic Industry (LEBIC) was founded to support small enterprise development in the Latvian Electronic Industry sector, company technological modernisation, production for export promotion and professional training for technical personnel. The founders of the centre are:

- Latvian Electrical and Electronics industry Association
- Riga Technical University
- Latvian University
- The Institute of Solid State Physics of the Latvian University
- Joint Stock Company "Alfa"
- Joint Stock Company "Vef"
- Joint Stock Company "Latviancentre For Disabled"
- "J. Smilgas Technologicalservice, Ltd"
- Innovation Company "Domas Baltikum" Ltd
- "Optron" Ltd
- Scientific Centre "Mikroelektronika" Ltd
- "Veltas" Ltd

The centre's focus is a well-developed electronic production base in the companies of the LEBIC, as well as in enterprises located in the neighbouring buildings or former JSC "ALFA" enterprises:

- JSC "IRM" is a powerful metal processing company and currently is a Latvian/Finnish joint company. It manufactures equipment, produces tools, and creates spare parts via a galvanising expertise;
- JSC "ALTON" is an electronic units assembling company. It performs electric assembling works for different sectors;
- Scientific centre "MIKROELEKTRONIKA" Ltd offers special micro-electronics devices project possibilities, as well as performing electronic units development and production;
- JSC "ALFA" is a producer of micro-electronics devices.
- LEBIC offers information on technological control measuring equipment, as well as implementing its delivery; renders technological services; renders advice on business management and financial recourses attraction.

5.3 Financing of innovation

Besides innovation support institutions, the availability of finance or venture capital is a crucial issue for the development of innovative entrepreneurship. Latvia has a comparatively well-advanced and stable banking system. However, its venture capital market is still relatively under-developed. A favourable environment for venture capital is considered as one of the most important issues in developing Latvia's competitiveness. Financial instruments are closely related to innovation, and that is why the issue was addressed during the preparation of the National Innovation Programme.

The Latvian-Swedish PHARE-twinning at the Ministry of Economy has contributed by providing a seminar on "The Latvian Venture Capital Market" on 11 October 2001 and a round table on 28 January 2002 entitled "What are the benefits of creating a Baltic VC Association?" These activities were devoted to the venture capital market environment in Latvia and options for improvements via policy actions.

The seminar provided clarifications of definitions and an overview of the current conditions in Latvia for early stage financing.

The second seminar had the purpose of establishing a **Baltic Association of Venture Capitalists**. The second event was organised as a Roundtable chaired by EBRD. The presidents of the Swedish and the European Venture Capital Associations (EVCA) were invited to the Roundtable to present their organisations and interaction between them. It was agreed among the participants to set up a Baltic Venture Capital Association. An interim group was established and mandated to prepare statutes.

The initiative of 28 January is important from several perspectives:

- the Association will be serve as a channel for public-private dialogue related to the environment for investors in Latvia;
- it is likely that the market players in the Baltic States will become more 'visible' and will thereby make it easier for companies to get in touch with investors operating in the region. This development is particularly important for SMEs with their limited financial networks.

- it will provide options for intensive networking among stakeholders in the Baltic countries, between Baltic financiers and their European counter-parties, as well as between the venture capitalists and the three Baltic Governments on topics related to the venture capital markets. As the dialogue with market players will be easier, it will probably impact policy considerations in a favourable direction for the industry.

Although the venture capital market in Latvia is in its early development stage, there are already a number of institutions and funds that offer venture capital for innovative start-up companies.

The European Bank for Reconstruction and Development (EBRD)

Despite the relatively large number of EBRD supported funds operating in the Baltic market, only one fund - **Baltic Small Equity Fund,** has invested in Latvia. The number of investments in Latvia through these funds until now is only about 13% of all the investment of the Baltic market. Nevertheless, EBRD forecasts that more investments will reach Latvia during the years 2002 and 2003.

According to the available information, there are four more venture capital funds, which have invested in Latvia. One of them is **NCH Advisors,** representing U.S. Institutional investors. The fund is operating in the Baltic States and Eastern European countries. Contrary to the aforementioned financial institutions, the investment from this fund in Latvia makes approximately 80% of all the investment in the Baltic market mainly thanks to the representative office located in Latvia. In 2002, the NCH Advisors are planning to keep the same level of investment as in 2001.

Another financial structure is the **Nordic Industries,** behind which are investors of the Nordic countries, mainly Icelandic investors. It does not operate like a fund with a defined amount of funds to be invested in Latvia. Nordic Industries has developed an industrial park in Olaine and has gained good local experience with respect to business preconditions and the environment in Latvia. Nordic Industries is looking for counterpart from the Nordic companies to implement concrete projects in Latvia. The Nordic Investors bring technologies, know-how and some funding to finance Latvian business plans.

Norway-Latvian Business Development Fund was founded by the Latvian Development Agency, but financing came from the Government of Norway and Alcatel Telecom of Norway.

The Baltic-American Enterprise Fund manages investments of the USA Government. The fund offers growth capital to small and medium size enterprises.

6. Major National Initiatives

6.1 Initiatives facilitating innovation, technology development and knowledge-based production

6.1.1 Development of innovative industrial clusters

Since 2000, Latvian industrial policy has increasingly focused on industrial clusters as an instrument to enhance industrial competitiveness, deliver focused State support and organise a dialogue between the State and the industry.

The Project 'Support to Industrial Cluster Restructuring', which was funded by the EU Phare and lasted from October 2000 till October 2001, is considered the first cluster development initiative in Latvia. The aim of the project was to raise the competitiveness of Latvian industry by popularising the concept of clusters and providing consultative support to individual potential clusters. Numerous areas of business activity were analysed in the initial phase of the project implementation, identifying fields, where Latvia has good prospects for the development of enterprise clusters. Four potential enterprise clusters were chosen for further consultative support, which, according to the type of basic activity, may be grouped in the following clusters:

- information systems cluster;
- forest cluster;
- composite materials cluster;
- engineering cluster.

Three of the four mentioned clusters can be characterised as hi-tech or knowledge based. One of the objectives of the project was to look for possible co-operation with enterprises of other sectors and research institutions, which in the future could potentially become the basis for the creation of new innovative products.

Information Systems Cluster

Readiness to participate in the project was expressed by 18 enterprises and organisations including: the most outstanding Latvian software companies; communication service companies and data centres; a testing company; universities; a vocational training centre; and web design, marketing and PR companies. The goal of the cluster is to increase the international competitiveness of the involved enterprises and grow exports by tightening mutual co-operation between ICT companies and related institutions. At the initial phase of the project, the main functions of the clusters focussed on providing the service of outsourcing of information systems' development and data processing services in the export markets.

The project defined concrete tasks for implementation and identified areas where closer co-operation between cluster members should be promoted. Working groups were set up matching concrete areas of cluster co-operation (working groups on human resources, marketing, education and training, project management and quality, etc.). A representative delegated by the management of cluster members worked in these groups during the whole time of project implementation.

Although the goals of clusters may be basically reached in the long term, enterprises and institutions included in the cluster have reached the agreement on closer co-operation in several areas which are important for raising the competitiveness of the cluster. Naturally, this means also respecting project management and quality assurance principles in daily work. The project also comprised a preliminary effort to implement co-operation between the enterprises in the area of human resources. This is very important for implementation of large projects and, especially, in the sector of information technologies. The necessity to focus on research and development issues was emphasized during project implementation. Several models of the possible establishment and financing of the cluster research and development centre were worked out. One of the project priorities was to promote co-operation between the enterprises of the cluster and universities. For this reason, in November 2001 the University of Latvia, Technical University and IT companies cluster members signed the agreement on reciprocal cooperation addressing such issues as perfection of study programmes, participation of enterprise representatives in the status of guest lecturers, and student internships in enterprises, etc.

After the completion of the PHARE project in October 2001, the co-ordination function of the IS cluster was taken over by the Association of Information Technologies and Telecommunications of Latvia.

Composite Materials Cluster

The most important participants of the composite materials cluster were universities and university research institutes working with material technologies focusing on the use of materials in medicine and other spheres. One of the key goals of the project was to set up a system of commercialising the current scientific developments and converting them into competitive products with a high value added. The project also included a wide survey of various aspects of commercialising scientific works (possible models of financing, intellectual property rights protection and patents, experience of other countries). One of the shortcomings identified in the project was the lack of adequate knowledge and experience in universities in connection with commercialising of scientific works, which, in turn, hindered the creation of high technology enterprises. The project also included the development of a model and a study of the possibility of setting up a high technology company on the basis of the existing institutes.

Engineering Cluster

The initial strategy of the cluster foresaw co-operation between enterprises producing optical fibres and using similar technologies and enterprises that could potentially use these products in their work. The company, *Anda Optec,* the leading optical fibre producer in Latvia, was chosen to become the centre of the cluster. During the implementation of the project and working with potentially interested companies, it was concluded that the initial idea to support cooperation between producers of optical technologies and consumers was, in many ways, a very sensitive issue. Consequently, the idea of the cluster was changed by devoting less attention to promotion of direct cooperation between individual enterprises and focusing more on reinforcement of the work of universities and institutes in the development of optical fibre technologies in Latvia.

After the end of the project "Support to Industrial Cluster Restructuring", the support to the development of clusters continues.

6.1.2 Project "Technological Park of Science"

To promote the development of innovative enterprises the Latvian Development Agency (LDA) in co-operation with Latvian universities developed the project "Technological Park of Science". The aim of the project is to create an innovative environment, which will ensure creation and efficient use of sustainable research and education potential, in the medium term substantially increasing the share in GDP of knowledge-based and knowledge intensive sectors. The concept of the Science and Technology Park is to:

- protect scientific advantages already achieved;
- assist in the creation of, and give support to, spin-off industries;
- develop, support and synergise between the different universities and industries;
- ensure Latvia's place in the development of new technologies;
- attract investment from established commercial operations;

6.1.3 Project "Latvian Multimedia Institute"

A joint Latvian-Swedish Twinning project for the establishment of a Latvian Multimedia Institute has been started. The idea of the project is to develop the present Department of Visual Communications at the Academy of Art into an international school for Multimedia. The Multimedia Institute will provide new interdisciplinary education and research supportive to emerging digitalised markets businesses. Visual communication is fundamental for the Institute hence the linkage with the Riga Academy of Art but the strength of the concept is a combination of aesthetics, technology, entrepreneurship and communication.

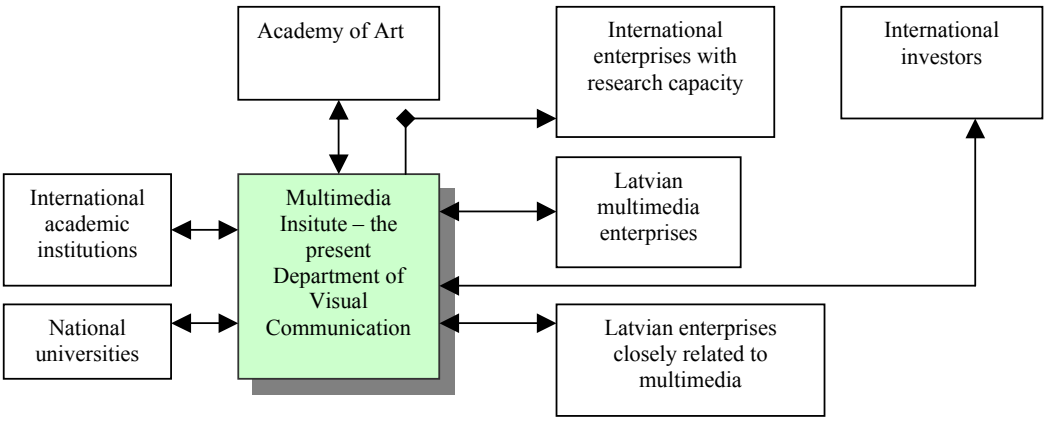
The idea is to foster skills for emerging interactive applications in areas such as banking, insurance companies, telecoms, media, but also in traditional manufacturing industries for which multimedia applications e.g. in sales promotion, will become a major tool. The Institute will be profiled in close co-operation with the enterprises attached by a "Partenariat". This will bring a constant influx of evolving market demands to the curricula and research orientation of the Institute. It is estimated that part of the student body will become entrepreneurs on new markets whereas others will bring new competencies into existing industries and services in the public or private sectors. They will all share an education targeting multifunctional new jobs.

The Multimedia Institute is expecting a demand for places from not only Latvian students, but also those from Baltic countries and, eventually, from other Eastern Europe countries. The demand for training and executive programmes for enterprises is estimated to be of significant importance as well. The planned interaction of various parties related to the Multimedia Institute is shown in the figure below.

The research capabilities and education will be cutting edge and promoted by intense international co-operation. Co-operation in flexible networks will be developed between Latvian academic institutions such as the University of Latvia, Riga Technical University and the Stockholm School of Economics in Riga, to strengthen the interdisciplinary profile of the Institute. Close co-operation will also take place with

Rosentala Art College in Riga. Within the Academy of Art, resources will be assembled by co-operation with the Departments of Graphics and Design. By networking and via more formalised cooperation with a number of universities abroad, in Europe as well as in the U.S., common research projects and exchange of lecturers will be part of the profile of the Institute. Student exchange programmes will be used for a further strengthening of international exchange.

Figure 6.1. Planned structure of Multimedia Institute



Source: Twinning project, Ministry of Economics

6.1.4 Participation in the 5th Framework programme of the European Union

Latvia participates in 5th Framework programme of European Union, which is one of the instruments for implementation of science policy in the European Union. If the previous framework programmes were more oriented towards basic research, then the 5th programme has a bigger emphasis on applied research, technology development and innovations.

23 projects from Latvia were accepted for this programme. The Innovation Relay Centre at the Latvian Technological Centre initiated seven technology transfer agreements in 2001/2002 under the programme.

Two projects may be mentioned as successful examples of Latvian participation in the 5th Framework Programme.

REG-ELIN-LAT

The general aim of the project was to create a professional support network for small and middle-sized enterprises (SMEs) of the electronics and IT sector in the regions of Latvia. This network would facilitate promotion of the involvement of Latvian enterprises and research institutions in Community R & D activities, new technology transfer and industrial collaboration with European entrepreneurs.

From the Latvian side the project participants were two regional universities, four Enterprise Support centres (ESCs) and the project coordinator the Latvian Electronics

and Business Innovation Centre (LEBIC). The ASTER agency from Italy and BIC NN centre from Netherlands ensured the integration of European experience into the project.

The project activities cover the regions of Latvia. The participants of the project work closely together with leading technological centres, scientific organisations and electronics and information technology (E&IT) sector companies, located in Riga.

The strategy of the project is based simultaneously on activating the intellectual potential of local resources, such as regional universities and ESCs; involving leading research centres and industrial enterprises of the E&IT sector; as well as focusing on the creation of long-term international collaboration contacts with EU research centres and innovative SMEs.

IRC Latvia

The main aim of the project is to promote the ability of Latvian SMEs to adopt new technologies, and develop existing technologies utilising the international co-operation instruments of EU. The activities include:

- organising of training, information seminars, conferences and brokerage events;
- analysis of the technological demand of Latvian SMEs and publishing them in the EU IRC network;
- preparation and distribution of informative materials on possibilities for co-operation with EU and candidate countries in the field of technology development;
- support for Latvian SMEs in preparing projects for EU and assistance in finding co-operation partners.

6.1.5 EU program "Trend Chart on Innovation in Europe

Latvia for the first time, in 2001, took part in the EU program "Trend Chart on Innovation in Europe" receiving its first evaluation.

Innovations are a priority for all EC member states. Numerous measures and support schemes with the aim of supporting innovative activity are implemented in Europe. Many of these today are already implemented or are in the process of implementation. The variety of such measures and schemes in the EU member states reflect the diversity of applied methods, cultural differences and political priorities. The insight into the common analytical and political situation in Europe in the area of innovation is presented in the results of the project started by the EC in 1996 – "First action plan for innovations in Europe".

The "Trend Chart on Innovation in Europe" is a practical tool for strategic developers and implementers of European innovation policy. The publication supported by the directorate general on business activity provides regular analysis of information regarding innovation programmes on the national and on the Commission level focusing mainly on innovation financing, launching an innovative business, protection of intellectual property and technology transfer between science and industry.

"Trend Chart" operates with the "open policy coordination approach" approved in the Lisbon meeting in March 2000. It gives support to planners and executors of European

innovation policy, aggregates information and statistics on innovation policies, and their implementation and trends in the European Union. At the same time, it also gives room for benchmarking and "good experience" exchange in the field of innovation policy.

6.2 Initiatives aimed at improving online access and information services

6.2.1 Development of online information services in support of entrepreneurship

Recently a lot of initiatives have been carried out by state institutions, agencies and municipalities to establish web based information services that will help Latvian companies to acquire information on technology, export markets, cooperation partners, etc. A few of them are described below.

In December 2001, the "Latvian Export & Import Directory" (ExIm) was founded as an on-line information portal. The target audience of this project are Latvian companies that are interested in establishing export-import relations and attracting foreign investments. The portal provides free of charge information to Latvian and foreign companies. The portal offers Latvian companies: the necessary information for development of their business (business opportunities, data bases of the foreign companies, exhibitions, trade missions, market data, business publications that are available in the Latvian business support organisations, etc.); and the opportunity to place and amend information about their services and products in the Latvian exporters and importers database for the target audience, namely international companies.

The portal provides the foreign companies with: information about the producers, exporters and importers of different products and providers of different services in Latvia; and information about business opportunities in Latvia. Business information currently is provided by the Latvian Development Agency (LDA), the European Information Centre, the Ministry of Foreign Affairs, embassies of Latvian Republic and associations of business enterprises. Development of the portal is still in process and will be carried out in several steps. Thus, in a near future, it will offer other marketing solutions to the companies (virtual product catalogues, homepages, etc.).

Another significant initiative, supported by the Latvian Development Agency (LDA) from Latvia's side, is a project "SME Website Baltic Sea States" (www.balticmarket.org). The aim of the project is to have a site on the Internet which gives SMEs of the Baltic Sea Region access to official, qualitative and applicable information about other countries of the region and which fosters mutual trade and investments in the region. Eleven Baltic Sea Region countries are involved in realisation of the project. The central portal, managed by Norway, contains information that is relevant for business start-up and mutual trade in these countries: business opportunities, custom duties, company registration procedures, taxation, labour market, credit institutions, intellectual property rights, etc. To realise this project in Latvia, already existing information materials from the LDA homepage have been used. In addition, especially for this project other new materials have been prepared such as databases on custom duties and foreign trade statistics, as well as a description of custom procedures in English.

As export oriented information and functions were transferred in December 2001 from the Latvian Development Agency (LDA) homepage to portal ExIm www.exim.lv, the

LDA homepage has since been targeted exclusively towards investors. The homepage provides information to investors about business opportunities and legislation in Latvia. Its popularity is constantly increasing among investors as the number of visitors to the site per month rises over the years (6650 in 2001, 7200-8800 at the beginning and 6480 during the summer of 2002). Currently the design, administration and information transfer of the publication is being revised. The revised design starts operating in August 2002 and will ease and speed up the publication of information.

In 2001, the implementation of the project "Establishment of a Common Network of Tourist Information Centres" was begun and continues in 2002. It will result in establishment of a national tourism portal and a common database for all tourist information centres in Latvia and for Latvian tourism information bureaus abroad. The project favours use of modern technologies in tourist information centres as rapidly developing hardware, software, Internet, information and reservation systems, e-commerce and other tools are important for fostering tourism business. The national tourism portal will greatly contribute to the provision of this objective and up-to-date information for every concerned person. It will also contribute to the development of a cooperation model between the state and the private sector. In addition, the project will make it easier for tourists to search for information on the Internet.

6.2.2 Public Internet Access Points in Latvia

The Soros Foundation Latvia in 1999–2000 implemented a project that was aimed at developing the Information Society, reducing social injustices in the area of information access, and making information technologies available to as many people as possible, especially in rural regions. In the first phase of the project, public Internet access facilities were established in public places in all parts of the country e.g libraries. Computers with Internet connections were installed, and these were available for free or for a small charge to anyone who wanted to work with them. The project provided financing for the computer equipment, as well as for the services of a qualified consultant.

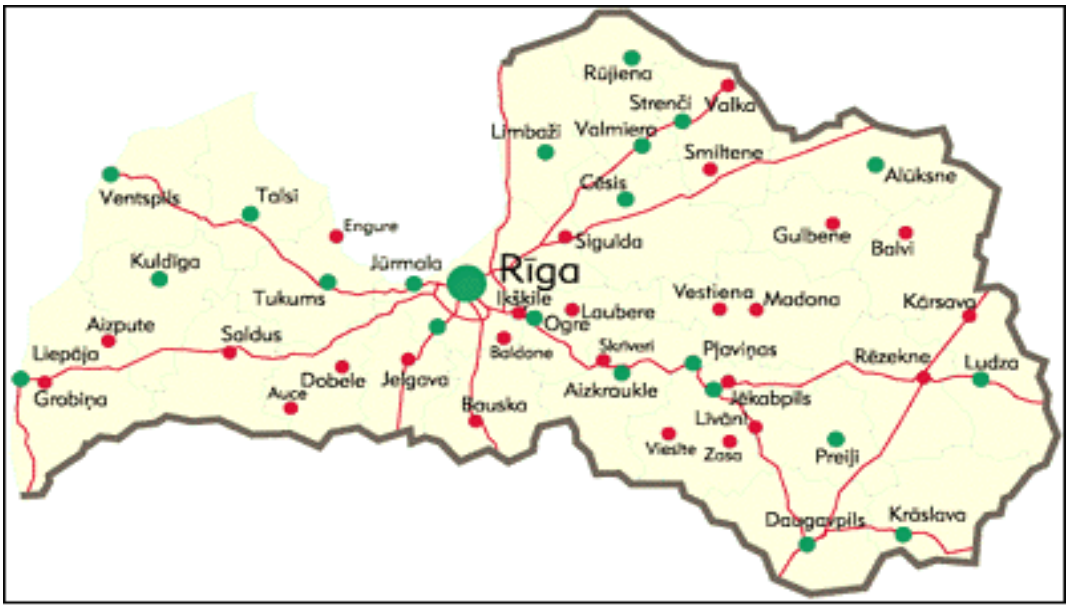
The main focus in this programme was to ensure that local residents were widely involved in all aspects of the process. This project cannot be evaluated too highly, because the establishment of the public Internet access facilities allowed people in various Latvian regions to access information, and it promoted the spread of the Internet and various information technologies throughout the country.

Financing under the auspices of the project was awarded for the purchase of computer equipment, the installation of an Internet connection, and the operations of the facility for the first year. There was also help of various companies in the implementation of this project.

In the second phase of the project there information servers (Web and E-mail) were established at Internet access facilities providing relevant additional training for staff at the centres. This allowed people not only to use Internet services, but also to begin establishing information systems within parishes and towns. The centres were also of key importance in economic development in the various regions. The services of the facilities were used by local businesses, and the centres served as a hub for other

Internet connections for companies and business centres. Those regions that were involved in the project also had additional opportunities to develop tourism.

Figure 6.2. Public Internet access points in Latvia



Public Internet access points in Latvia.

Source: Soros Foundation Latvia, 2000

Conclusion

Reduction of the general level of economic inactivity; active interpretation and schooling; and an increasing level of participation by everybody, are the only possible ways to achieve national goals in the foreseeable future. These actions require active, coordinated and interested liaison between public sector institutions, businesses and citizens. There is no doubt that the action model presented involving all social strata will ensure the implementation of the aforementioned development activities, and the achievement of the desired results.

Latvia's strategy and actions are based: on implementation of a truly innovative approach, exploiting in full measure opportunities that are provided by increased knowledge potential; on revision of traditional procedures in any sphere of life and restructuring them where necessary; and on expanding the capability of every individual. Innovation means not only research and development of new products, it includes a modernised approach, newly formed methodologies, a modified mindset and style of activities. Qualitative changes will result in making industry and services more efficient; governance more effective; and social policy more comprehensive. Maximal social and cost-benefit effects can be achieved only by performing these activities.

Through successful implementation of this policy the information society will gradually emerge in Latvia as part of the process of the development of a community of highly educated individuals and of a knowledge-based economy.

Annex I - Knowledge-Based Economy Indicators

1. Network Access

1.1. Information infrastructure

• Telephone penetration (number of mainlines per 100 people)
31
(Source: Lattelekom, August 2002)

• Mobile wireless penetration (%), growth trend
34.2%, more than 80% yearly growth trend (2001/2000)*
(Sources: LMT, August 2002; Central Statistics Bureau of Latvia)
** estimate, as data about number of mobile telephone subscribers of the second mobile operator Tele2 are not to be disclosed by the company*

• Total number of mobile telephone subscribers
*800,000**
** estimate, data about number of mobile telephone subscribers of the second mobile operator Tele2 are not to be disclosed by the company*
(Sources: LMT, Central Statistics Bureau of Latvia)

• Total number of mobile telephone subscribers per 1000 people
*3.42**
** estimate, data about number of mobile telephone subscribers of the second mobile operator Tele2 are not to be disclosed by the company*
(Sources: LMT, Central Statistics Bureau of Latvia)

• Wireless penetration (percentage of the population), growth trend
N/A

• Total number of cable TV subscribers
250,000
(Source: Latvian Cable TV Association, August 2002)

• Cable TV subscribers, % of households
31.25%
(Source: Latvian Cable TV Association, August 2002)

1.2. Internet availability

• Total number of ISP providers
Approximately 50, according to Latvia Internet Association. The Regulator has recently introduced ISP licensing policy, thus exact figures should be available in near future.
(Source: Latvian Internet Association, August 2002)

• Prevailing types of ISPs' networks (microwaves/radio…)
Since the fixed telecommunications network was initially planned to be under Lattelekom monopoly until 2003, most of the competing ISPs' networks are built on

wireless technologies. When it comes to the development of broadband Internet services, radio networks in the 2.4 GHs range are of great importance. Thanks to these technologies, affordable services can be provided as an alternative to the far more expensive dedicated lines of the monopolist. Alternative fixed networks are gradually being developed in the larger towns and cities. Cable television and fiber optic networks are among them.

- % of unsuccessful local calls

N/A
(Data not to be disclosed by Lattelekom)

- Is there competition among ISP providers?

The total number of ISP operating in Latvia is approx. 50. Among them 4 are strong, large national ISPs - Apollo (ISP division of Lattelekom), Delfi (Microlink subsidiary), Latnet, Telia Latvia (Telia subsidiary) - with total market share of 80%. There are a number of smaller providers, some operating on regional (e.g. country region, city) territory. Competitors are significantly constrained by the telecommunications monopoly in Latvia. Public fixed network is under Lattelekom monopoly until 1 January 2003. After the Lattelekom monopoly, the situation is expected to change. Internet prices may drop thanks to lower network operating costs, but not significantly, since the Internet services market is already competitive.

- What are the opportunities for public Internet access (libraries, Internet-cafes, etc.)?

Large libraries offer their information online. Some, including the Latvian National Library and the Latvian Academic Library, have special Internet classrooms. Internet cafes, too, have been in operation in Latvia since 1995. Most are in the larger cities, especially in Rīga.

A particular initiative has been that of the Public Internet Access Points, which Latvia's local governments initiated with the help of the Soros Foundation in 1999 and 2000. Internet access facilities – mostly in libraries and local government buildings – were provided with computers and Internet connections.

Schools are another place where Internet access is provided in the countryside. Schools often have computer classrooms with Internet connections that were set up under the auspices of the Latvian Education Informatisation Project (LIIS).

The Local Government Information Systems Program also involves the installation of connections in local government institutions, libraries and schools.

- Are there dedicated line lease possibilities? Are there competing providers?

Since the fixed network is under Lattelekom's monopoly, there is only one leased line provider until 1 January 2003. Both national and international digital leased lines are available (9,6 Kbps-155 Mbps). Internet development and prices are considerably influenced by Lattelekom's monopoly on leased lines. Companies including national energy company Latvenergo, railroad, radio and television centres and a few private emerging datacoms have the basis to create competition after the monopoly ends. Competition will appear in long-haul communications and in last-mile markets in cities.

1.3. Internet affordability

• What are the prices of Internet access (unlimited access, per minute charge)?
The price for unlimited Internet access service for business customers starts at approx. 60-80 EUR/month depending on service performance. For private users unlimited access price is in 25-70 EUR/month range. Per minute charge is in range of 0,01-0,06 EUR/min depending on service class and time.
(Source: Latvian Internet Association, August 2002)

• Is it affordable for majority/minority (compare with average salary/income)?
Prices of Internet services are comparable with the average level in Europe. However, compared to average income,e prices are very high. In terms of service prices, these have declined several times in recent years, but no further decline would be economically justified on the part of the ISPs. An increase in service use can be expected as the country's residents earn more money and improve their knowledge about the Internet.

• What are the rates for leasing lines?
Rates for national digital leased lines, range from 118 EUR/month for 16 Kbps to 738 EUR/month for 2 Mbps regardless of distance. Rates for international leased lines are very high. Rates depends on speed and connection destination. Plain copper wires are not available until 1 January 2003 because of the monopoly situation.
(Source: Latvian Internet Association, August 2002)

• Are the rates affordable for small businesses or individuals?
Prices of digital leased lines are too high and unacceptable for the most businesses and individuals. This is the main reason why wireless networks are popular. At the moment DSL services are available in cities from the monopoly Lattelekom. These services are significantly lower priced and thus more popular than leased lines.

1.4. Network speed and quality

• What is the percentage of successful calls?
High
(Exact data not to be disclosed by Lattelekom)

• What is the quality of voice connection?
High

• How many faults are reported per year for each 100 telephone mainlines?
N/A
(Data not to be disclosed by Lattelekom)

• How long it takes to clear faults (48 hours, a week, month)?
2 working days (95.5% faults)
(Source: Lattelekom, 1st-2nd quarter, 2002)

• Which services are supported by local telecommunications infrastructure: e-mail, high-speed modem connection, what is the maximum speed?

E-mail services are available either from ISPs or content providers (portals) for free. Most of the ISPs support analogue modem speeds up to 56 Kbps and ISDN up to 128 Kbps. Internet connections are available at speeds up to 1 Gbps.

- Are there sufficient backbone facilities/networks? Even for peak demand?

Mostly yes. New last mile providers are emerging. However there are problems with long-haul broadband connections in rural areas.

- What is the percentage of packet loss by the network?

Typically packet loss is less than 1%
(Source: Latvian Internet Association, August 2002)

1.5 Hardware and software

- Are there local IT hardware/software sales points?

Yes, more than 100 local hardware/software companies offer their products at sales points. 60% of them are located in Riga.

- Is the price of IT hardware/software affordable for majority/minority of citizens/businesses?

For the last 2-3 years the price for hardware has dropped dramatically. PC and networking hardware, especially of Latvian origin is of affordable price to businesses and citizens (for example, price of locally assembled PC is about the one month salary). As for software, several Latvian companies offer original software, mostly accounting and office management systems, localisation tools, which are an affordable price to businesses. The software from leading international companies (eg., Microsoft, Oracle) is still quite expensive.

- Is there software in local languages?

Yes. Both original software made by Latvian companies, as well as localised versions of International products, for example MS Windows, MS Office.

- Is software imported or adapted locally? (percentage of the imported, adapted, produced locally hardware or software in total number in circulation)

Both.

- Is there a broad variety/some/very few software business applications?

There is a broad variety of software business applications. Most of the international products are presented in Latvia. Local companies provide their original business applications, which are used not only in Latvia, but also exported to other countries.

- Are the IT software/hardware retail and wholesale markets competitive and vibrant?

IT software/hardware market has grown rapidly during the last 5 years. (see table)

Latvian ITTE sector (Market size) NACE classification

	1996		1997		1998		1999		2000		2001	
NACE	Turno-ver (in LVL)	No of comp a-nies	Turno -ver (in LVL)	Turn-over (in LVL)		No of com-panies	Turno-ver (in LVL)	No of comp a-nies	Turnover in LVL)	No of comp a-nies	Turnover (in LVL)	No of compa-nies
22.33	158942	2	0	0	126190	3	25553632.81	9	2529325.85	12	156459358.2	73
30.00	26958	1	51734.57	2	378973.72	3	179145.66	7	1469718.87	10	61532073.53	78
30.01	0	0	0	0	0	0	0	0	2199465	6	13787861	15
30.02	1583.81	1	69670	2	0	0	3003130.44	6	2652468.85	11	80917855.9	59
32.00	0	0	0	0	5804	1	1268810	1	5730584	1	8436575.25	22
32.10	153307	1	249153	1	249994	1	924095.43	2	3812052	1	99588024.07	27
32.20	50230	3	155671	2	89485	2	6969047.65	6	4511614	2	54374784.7	43
32.30	43604.12	2	96610.03	2	117539.65	4	2046983	3	1209817	8	50476518.02	43
33.20	0	0	65831	1	12557	2	485305.99	8	154891.6	4	57432554.64	64
33.30	0	0	0	0	0	0	190653531.3	2	1208613.43	6	91390229.58	34
51.64	595228.71	5	2846505.33	8	2107788.49	7	11590425.29	14	83000397.34	26	267347300.3	210
64.20	14539.52	2	663782.32	3	224469	3	2248496.96	7	20711975.89	17	118530026	152
71.33	0	0	2400	2	485523.73	4	2839887.14	8	3427809.53	12	91240999.56	74
72.00	8845.09	3	39950.2	3	3098150.64	7	525169	9	4789295.42	25	152502123.4	173
72.10	0	0	6270	1	1431910.94	7	2739814.75	11	11706820.64	16	101304265.3	117
72.20	177902.6	10	340609.86	9	882090.01	15	7058841.19	21	63570769.62	27	226256005.5	251
72.30	352323	8	19531	3	290426.73	6	1795513.16	9	4922530.69	17	111251734	189
72.40	100161.55	2	1528506.81	6	766596.35	12	1237528.45	15	34853301.06	22	246291516.9	313
72.50	100489	7	1413778	8	2642092.08	14	10751340.39	23	40956648.21	28	303034763.4	244
72.60	99357	3	3465200.62	6	1245097.94	8	7630475.24	32	67152798	39	200635870.2	357
TOTAL ITTE market (in LVL)	1 883 471.40		11 015 203.74		14 154 689.28		277 477 526.85		174 690 678.80		3 559 561 139.14	

Source : Official data from Enterprise register, 2002

1.6. Service and support

• How long is the waiting period for telephone line instalment? (total number of those on the waiting list; waiting period: days, weeks, months, years)
Waiting list – 13,551

Average period for telephone line installment from the moment of application:
8-10 working days for residents,
4-8 working days for corporate business
(Source: Lattelekom, 1st half, 2002)

• How long is the waiting period for reported telephone line problem to be fixed? (minutes, hours, days and etc.)
2 working days (95.5% faults)
(Source: Lattelekom, 1st-2nd quarter, 2002)

• Are there software developers, web designers, network administrators and other technical personnel, and how many (working where, employed/ unemployed)?
The figures of ICT specialists in Latvia are presented in table:

Average number of employees in ICTE sector

General economic activity	*NACE*	*Average number of employees*		
		1999	*2000*	*2001*
Telecommunications	*642*	*7446*	*7129*	*6756*
Computers and computer-related operations	*72*	*3168*	*3369*	*4235*
Total:		*10,614*	*10,498*	*10,991*

Source: Central Statistics Bureau, 2002

2. Networked Learning

2.1. Schools' access to ICTs

(Source – Ministry of Education and Science, March 2002)

• Are there computers in schools? How many students per computer? On which level (university/secondary/primary)?

	Secondary and primary	*Universities*
Number of schools	*1029*	*34*
Number of computers in schools	*13369*	*5145 (October 2001)*
Number of schools with computer labs	*934*	*32*
Number of computers per school	*16*	*206*
Number of students	*336824*	*110500*
Students per computer	*25*	*21*
% of schools with computer labs	*91*	*N/A*

• Who has access to computes (technical staff/faculty/students)?
In 934 schools (from 1006 schools having computers, i.e. 93%) students have access to computers.

• What is the quality of hardware (386/486/Pentium…)?
Pentium or equivalent.

• Are there LANs in schools? Regional WANs? National school networks?
Mostly yes. The LIIS program has allowed many schools to obtain computers and Internet connections. A national connection to the European GEANT academic network, which is administered by Latnet, has been established.
LANs are mostly Windows NT based, but there are also Unix LANs.
Regional WANs are built around Latvian Education Informatisation System LIIS Regional support centres (in 26 regions).
*National schools network is built between the I*EARN participating schools.*

• Do schools have Internet connectivity? Is it dial-up or through a leased line, wireless?
75% of schools use the Internet. 372 schools (36%) use permanent Internet connection.

2.2. Enhancing education with ICTs

• What are the computers used for? What is the level of computer literacy/skills?
From 1998 various training programmes for teachers were designed in the framework of LIIS, updated and implemented for the regional centres of LIIS. In 2001 these programmes were tied with the content of the European Computer Driving Licence (ECDL), but taking into account the specific needs of teachers. 24458 teachers were trained at June 2002 (13306 teachers – using local government financing, 11152 – using LIIS financing). ICT trained teachers make 70% of total number of teachers in Latvia. About 190 informatics teachers were trained at advanced level (computer lab maintenance, NT server administration, database development, Visual Basic). About 300 tutors-trainers were trained at the end of 2001. In 2001 the emphasis was put on school network administrator training and on the training according to the ECDL content. 350 teachers received the ECDL certificate in 2002. In 2002 there is an expansion of distance education and advanced training of informatics teachers. The ICT usage in subject teaching is covered (including school librarians).

• What is the level of information and communication technologies integration in the curriculum?
Since the beginning of LIIS in 1997 the teaching aids have been developed to an amount equivalent to 85 000 printed pages. Using these materials together with original software ensures that approx. 20% of the high school program can be taught in a computerised way. In some disciplines, e.g., Latvian language and mathematics, this percentage reaches 75% of the whole syllabus.

2.3. Developing the ICT workforce

• Are there training opportunities for programming, maintenance, and support?
There are 13 training and skill upgrading facilities in Latvia. There are also two software technology parks and five testing and certification facilities.
• Who is offering them (public/private centres)?

Both public and private universities, as well as private companies are offering higher professional education and specialised courses in ICT.

- Are they affordable for majority/minority of the population?

ICT education is affordable for majority of the population.

- Is there an on-line training available?

Yes. Several universities offer this possibility.

- Do employers offer training?

Yes.

3. Networked Society

3.1. People and organisation online

- What the percentage of the population:
  - Is aware of Internet existence?
    60-70%
  - Has used Internet recently?
    40-50%
  - Uses Internet regularly?
    21% of the economically active population

(Source: Latvian Internet Association, August 2002)

- What is the structure of users by gender, age, social and educational status?

N/A

- What is the number locally registered domain names (per 1000 people)?

3.38
(Source: Latvian Internet Association, August 2002)

- Is there advertising for online companies, and how common is it?

Online advertising market growth in 2001 was 400%.
(Source: Latvian Internet Association, August 2002)

3.2. Locally relevant content

- Are there (and how many: no, few, some, many) websites:
  - Providing local topics?
    Many
  - In local languages?
    Most

- How often are they updated and is content static or dynamic?

Biggest and most popular sites are updated daily and content is dynamic.

- Are the above web sites created in the community?

Yes.

• Are bulletin board systems, Usenet groups, newsletters, and/or listservs in use?
Yes, widely

• Are there opportunities for Web-related training?
Yes

3.3. ICTs in Everyday life

- Does population include information and communication technologies (phones, faxes, pagers, computers) in everyday life?
  Yes. Phone, fax, e-mail, computer, mobile phone is an unalienable part of everyday life in Latvia. Especially widespread use of ICT is in Riga and other major cities, while use of modern technologies is moving also to rural areas.

- Are there phones, wireless phones, digital assistants, pagers, PCs and are they being used regularly? Are they used for household commerce (banking, online shopping, investing) and social and commercial interaction (bartering, online chat and etc.)
  They are being used regularly among the active Information Society members. Percentage of households using these devices and services is increasing. There large number of online banking users. Chatting is also becoming popular, particularly among young people.

- Are there PCs with e-mail capability available (cyber cafés, telecentres) and are they being widely used?
  There are several internet cafés, and the number of users of them is growing, although the main place to use PCs is at work, schools and at home.

3.4. ICTs in the workplace

• Do employees have:
  - (Un)limited access to phones?
    Mostly unlimited access for the work purposes. Depending on the sector and region there are some limitations.

  - Personal e-mail accounts?
    Mostly every employee has e-mail account, if he or she has computer and Internet access. Depending on the sector, occupation and region there are some limitations.

  - Internet access from personal workstations?
    Mostly every employee has Internet access, if he or she has computer and Internet connection. Depending on the sector, occupation and region there are some limitations.

  - E-mail and web addresses on business cards?
    This is as typical as having a phone number on a business card.

• What percentage of businesses and government offices has computers, how many of them, how many employees use them?

There are 135,900 computers at work
(Source: Central Statistics Bureau of Latvia, 2000)

• Are they networked?
Almost all of them.

• Is business mostly conducted in person or by e-mail, or are there data sharing, enterprise, reporting, transaction, and research applications? How intensively are they used?
In most e-mail is the main means of communication both between employees of the same company, as well as for communication between different companies.
The large corporate companies as a practice have ERP and other advanced data management and sharing applications. Also company intranets are common.

• Are there efficiency gains resulting from the use of ICT systems?
Definitely. Company managers from both large corporate and SME sector see ICT applications as an efficient tool for increasing productivity and reducing costs. Of course, intensity of ICT system use differs from sector to sector. The major ICT system applications are in banking and finance, communications and utilities, as well as services sectors.

4. Networked Economy

4.1. ICT employment opportunities

• Are there opportunities for technically skilled workers within the country?
Yes. ICT skilled people are in the highest demand and their salary averages are amongst the highest in the country.

• Are companies from outside of the country investing in IT related projects?
Yes. Most international ICT brands like Microsoft, HP, Siemens, IBM have invested in IT related projects both in public and private sectors in Latvia (for example, eRiga project, project for Ministry of Social Wellfare, etc.).

• What is the portion of knowledge workers and information related business in the economy? (percentage of labour force, percentage of GDP)?
N/A

• Are businesses considering IT in their strategies?
Yes. IT strategy normally becomes part of company's overall strategy.

4.2. B2C electronic commerce

• Do local businesses have websites and how many? Is content current or static?
7.4% of all companies and 18.7% of companies with more than 10 employees have website (end of 2001)

• Are there online B2C transactions, or are transactions mainly oral and/or paper-based, phone or fix-based?

Yes, there are online transactions, which are possible without any paper-based activities.

• Is online retail noticeable component of the overall commercial activity?
Online retail is not significant part of overall commercial activity. 166 000 EUR in 2000, 464 000 EUR in 2001, 650 000 EUR estimated in 2002.

4.3. B2B electronic commerce

• What are the sources of market information, are they sufficient for providing transparency?
Yes, there is a national e-commerce concept publicly available, statistics and advice are available from ministries, statistics bureau and Internet association. TheInternet is also increasingly becoming an important source of market information. According to information of Central Statistics Bureau, about 12% of enterprises had their web pages in 2001.

• Are there online B2B transactions, or are transactions mainly oral, paper-based, phone or fax-based?
Yes, there are B2B transactions, mostly conducted via Internet. The volume in 2000 was 10,000,000 EUR, in 2001 was 15,800,000 EUR, in 2002 estimated 25,200,000 EUR (Source: Latvian Internet Association, August 2002).
Online B2B transactions are developing quite rapidly in Latvia. One of the most popular types of transactions is usage of online banking, which is rapidly developing and facilitates development of other forms of B2B in Latvia. The largest B2B enterprise in Latvia is international hardware selling company GNT.

• Can transactions be conducted online without any paper documents? Is the process automated? Does it allow online tracking, monitoring?
Transactions are mostly conducted without paper documents, however often initial paper based agreement is required to establish completely automatic and electronic co-operation.

• What portion of B2B activity is conducted on line? Is there gain in efficiency?
There are no official statistics available about the percentage of all transactions performed online. Yet, the general trend is that B2B transactions are increasing. There is gain in efficiency, since the transaction volume is continuously growing.

4.4. E-Government

• Number of government resources online? Does it include information, hours of operation, any services? Is information current and relevant?
Most of the government institutions have websites, containing information about functions and services. Many have information not only in Latvian, but also in Russian and English. Information is updated regularly.

• Is there online interaction between government and citizens, or is interaction mainly oral, paper-based, phone or fax-based?
On the ministerial level there is high level of interaction online, while on municipal level interaction is mainly paper and phone-based. It is planned to adopt the law on

electronic documents in the nearest future and to implement e-documents by 2004 – this will accelerate the process very much.

• Is there online interaction between government and suppliers and contractors, or is the interaction mainly oral, paper-based, phone or fax-based?
There is high level of interaction online already. For example, the website of the Ministry of Finance has a chapter about procurement, where it is possible to download applications, etc. It is planned to adopt the law on electronic documents in the nearest future and to implement e-documents by 2004 – this will accelerate the process very much.

• Is it possible to download applications from the websites?
Yes, it is possible to download tax and customs declarations and other documents. Especially notable are institutions like State Revenue Service (IS developed already for 5 years, approx. 20 millions of lats invested), the website of the Cabinet of Ministers, the State Enterprise Register and their web page (information requests processed using web, SMS and other technologies), etc.

• Can citizens apply for permits, licenses, and taxes on line?
Yes.

5. Network Policy

5.1. Telecommunications regulation
• Is liberalisation of telecommunications sector planned or implemented?
To begin on 1 January 2003.

• Is there competition between telecommunications service providers?
There is competition among mobile telecommunication operators.
• Is broadband Internet access offered?
Yes.

• Is regulation set and enforced by an independent body?
Yes, by regulator – Public Utilities Commission.

5.2. ICT trade policy

• Do tariffs or other restrictions (technical standards, domestic regulation, etc.) exist?
There are at present restrictions for offering fixed communication services, company Lattelekom still has exclusive rights for offering above mentioned services. Other ICT service sectors do not have any specific restrictions.

• Are there restrictions in the service (including information services) sector?
There are no restrictions for trade in service sector (except for fixed telecommunications sector to be liberalised in 2003). The trade policy is in line with the international norms.

• Are there disproportional taxes on electronically delivered services?
The tax regime is the same for electronically delivered services.

• Is Foreign Direct Investment in IT sector existent, and is it encouraged, discouraged, restricted?
Foreign direct investment in IT sector is encouraged by favorable investment regulations. Figure of FDI in IT sector for recent years are presented in following table:

Annual FDI Inflow

Year	*Number of companies registered*	*Equity capital in US$ million*
1995	*815*	*160632*
1996	*686*	*164767*
1997	*856*	*279657*
1998	*858*	*181647*
1999	*945*	*133306*
2000	*915*	*132648*
2001	*924*	*165590*
2002 (I-VI)	*525*	*162102*
TOTAL		*1742142*

Source: Latvian Development Agency, 2002

6. Media

6.1. Radio, TV and newspapers

• Number of Radio and TV stations, newspapers, the size of audience/circulation

Media	*Number of broadcasting companies*	*Total length of programmes (hours)*
TV	*24*	*45264*
Radio	*27*	*245776*

Newspapers

	1995	*1996*	*1997*	*1998*	*1999*	*2000*
Number of titles	*286*	*252*	*229*	*226*	*235*	*227*
Single circulation (thous. copies)	*2915*	*2049*	*2016*	*2179*	*2105*	*2081*
Annual circulation (million copies)	*223*	*179*	*188*	*185*	*183*	*181*

Source: Central Statistics Bureau, 2000

6.2. Employment in the media

• Number of employees in the media

Number of employees

	2000	*2001*
Production of newspapers	*1865*	*2131*
Production of magazines and other periodicals	*1853*	*2201*
Radio and TV	*1995*	*1855*
News agencies	*172*	*185*
Total	*5885*	*6372*

Source: Central Statistics Bureau, 2000-2001

• Trend: is the number increasing/decreasing?
The general trend is that the media business is developing in Latvia and thus the number of employees in this sector is gradually increasing as well

7. Intellectual Capital

Source: Patent office of the Republic of Latvia

7.1. Patents

• What is the number issued per annum?

	1995	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*
Granted patents - total	*628*	*775*	*407*	*328*	*258*	*328*	*323*

• What are the trends?
The number of patents issued remains rather stable.

7.2. Copyrights

• What is the number issued per annum?
N/A

• What are the trends?
N/A
Copyrights are not registered by state institutions, thus statistics are not available. The copyrights are protected by legislation and relevant international treaties.

7.3. Licenses

• What is the number issued per annum?

Registered License Agreements

	2000	*2001*
Of Inventions	*20*	*25*
Of industrial designs	*1*	*1*
Of trademarks	*19*	*19*
Of industrial designs and trademarks	*4*	*2*
Total	*44*	*47*

• What are the trends?
The general trend is that the amount of license agreements issued per annum is increasing.

7.4. Trademarks

• What is the number issued per annum?

	1995	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*
Registered trademarks	*4050*	*7777*	*7562*	*8260*	*5774*	*6839*	*7356*

• What are the trends?
The amount of registered trademarks is fluctuating, yet is slightly increasing.

7.5. Scientific and/or tech associations

• List with a brief profile
There are a large number of associations and other non-governmental organisations operating in Latvia. Below is a list and brief profile of those that are most directly linked with development of knowledge-based economy.

The Latvian Academy of Sciences

The Latvian Academy of Sciences is an autonomous state subsidised non-profit scientific institution which consists of elected members of the Academy of Sciences.

Since 14 February 1992, the Latvian Academy of Sciences has functioned as an association of scientists in consonance with its newly developed Charter and Statutes. The Latvian Academy of Sciences (LAS) represents Latvia in the International Council of Scientific Unions (ICSU) and in the Association of All European Academies (ALLEA). The main aims and tasks of the LAS have been formulated in the Charter, to be mentioned here: favouring research in the basic and applied sciences, especially in interdisciplinary research; promoting studies in Latvian history, culture and the development of the Latvian language; active participation in establishing Latvian science policy and consulting of the government on scientific issues; care about publishing of scientific literature, developing scientific terminology and maintenance of scientific standards in encyclopaedias; organisation of congresses, conferences, discussions and competitions, popularisation of scientific achievements; maintenance of

international contacts of Latvian scientists; protection, maintenance and perfection of research ethics, discussion principles, and traditions.

The Latvian Council of Science

The Latvian Council of Science is a collegial body of researchers that deals with science and research problems within the country. The Council was founded in accordance with the decision of the Council of Ministers in July of 1990.

The Latvian Council of Science:

- makes conceptual proposals on science and technology policy for the Cabinet of Ministers and the Ministry of Education and Science;
- defines priorities for the development of science and research areas;
- proposes the draft of the state science budget for the current year;
- elaborates on projects for decisions and legislative acts aimed at developing the organisational and financing system for science and research;
- organises the evaluation and funding of basic and applied research projects;
- promotes co-operation and integration between research institutes and higher education institutions

Latvian Association of Technological Parks, Centres and Business Incubators

On 18 September 1996 the Latvian Association of Technological Parks, Centres and Business Incubators (LTICA) was established and united several innovation support institutions. The main objectives of LTICA are:

- to create permanent links among all the business support structures in Latvia;
- to raise the qualification of the members of the LTICA;
- to represent and to protect the interests of its members at various governmental and non-governmental institutions and organisations;
- to create an information network to support technology-oriented SMEs;
- to promote the establishment of new business support structures;
- to support technology transfer and innovation;
- to create contacts and participate at various different international and regional associations;
- to cooperate with self-governmental and local authorities, science and research centres;
- to publicise the LTICA and the activities of its member, etc.

The Latvian Information Technology and Telecommunications Association

The Latvian Information Technology and Telecommunications Association (LITTA) is a Non-Governmental Organisation, founded in 1998, that regroups the majority of significant software companies and telecoms as well as about one hundred individual professional members in the ICTE industry sector in Latvia, namely in electronics, computer hardware and software, as well as in telecommunications infrastructure and service providers.

The principal objective of LITTA is to promote and further the development of the Information Society in Latvia so that all citizens may be given the opportunity to benefit

from IT and become full partners in the New Economy. LITTA works toward increasing e-awareness in society by organising conferences and educational endeavours and takes an active part in preparing professional study programmes for IT specialists. It also provides expert advice to Governmental institutions on legislative and other matters related to ICTE, and maintains close links to other more specific ICTE industry associations, as well as to corresponding organisations abroad. LITTA is a spokesman on behalf of the ICTE industry in Latvia.

The Latvian Electrical Engineering and Electronics Industry Association

The Latvian Electrical Engineering and Electronics Industry Association (LEtERA) is a public non-governmental organisation founded in 1995. LEtERA represents the electronics and electrical engineering industry in Latvia. The principal objective of LEtERA is to promote development of the sector as well as to further co-operation and professional growth among industry specialists.

8. Education

Source: Ministry of Education and Science

8.1. Higher education

• Total number of high education establishments (public/private).

	Public	*Private*	*Total*
1990	*10*	*2*	*12*
1992	*14*	*6*	*20*
1994	*17*	*9*	*26*
1996	*18*	*13*	*31*
1998	*19*	*14*	*33*
2000	*20*	*13*	*33*
2002	*20*	*14*	*34*

• Total number of students (total average per annum, in the private and in the public sector)

	Academic year		
	1999/2000	*2000/2001*	*2001/2002*
Public	*77620*	*86671*	*88239*
Private	*11890*	*14599*	*22261*
Total	*89510*	*101270*	*110500*

• Prevailing specialisations (distribution of students among the fields)
Academic year 2001/2002

Study field	*% of all students*
Social sciences	*51.6*
Pedagogy	*16.2*
Engineering & technology	*10.4*
Nature sciences & mathematics	*7*
Humanitarian sciences	*7*
Health & health care	*3.6*
Services	*2.4*
Agriculture	*1.8*

• Cumulative number of population with higher education degrees (total and in science and technology fields)

	1989	*2000*
Number of people with higher education	*132336*	*148385*
Total number of people 15 years and older	*1147486*	*1072168*
Percentage of people with high education (15 years and older)	*11.5*	*13.9*
Number of R&D personnel	*-*	*5448*

Source – Population Census 2000

8.2. Distant learning

• Distant learning facilities

The Latvian Cabinet of Ministers made the decision to support the Latvian Virtual University programme as e-learning development and university co-operation.

Several universities are active in distant learning. The most experienced is Riga Technical University (Distance Education study centre). Other universities are already involved in this field, for example, Liepaja Teacher Training Academy, University of Latvia, the private collage "Turiba".

There are some universities interested in e-learning – the distance learning study centres in University of Daugavpils, Latvian University of Agriculture, Valmieras Augstskola etc.

• Number of students trained per center
N/A

9. Labor Force

9.1. Employment in science and technical fields

• Number of employees and trends in the fields
R&D personnel by performance sector

Sector	*Number of R&D personnel (end of 2000)*
Higher education sector	*2890*
Public sector	*1192*
Business sector	*1366*
Total	*5448*

• Compensation rates in the fields (average salaries)

The compensation rates in the technical fields including ICT has increased during the last years. The average level is given in the following table:

Average monthly salary level of ICT specialists (gross, US$)	*Years of experience*		
	More then 5 years	*3 years*	*Less then 3 years*
Network engineers	*1311*	*742*	*708*
Programmers	*1426*	*915*	*718*
System analysts and designers	*1598*	*1165*	*986*
Data entry operators (technical writers)	*1276*	*850*	*749*

(Source: Annual compensation report, Fontes R&I consultants, 2001)

9.2. Employment in electronics industry

• Number of employees and trends in the fields

	1999	*2000*	*2001*
Number of employees in electronics industry	*5508*	*5570*	*5269*

• Compensation rates and trends in the fields

(see 9.1.)

9.3. Employment in telecom industry

• Number of employees and trends in the fields

	1999	*2000*	*2001*
Number of employees in telecom industry	*7177*	*6774*	*6678*

• Compensation rates and trends in the fields
(see 9.1.)

10. Research and Development

10.1. Research institutions

• Number of research institutions

Sector	*Number of institutions (end of 2000)*
Higher education sector	*49*
Public sector	*31*
Private sector	*191*
Private non-profit sector	*2*
Total	*273*

Source: Central Statistics Bureau

10.2. Investments in research and development

• The total amount, government and private business breakdown of total investment in research and development

Investments in R&D according to their sources (2000)

	Million Lats	*Million USD*
State budget	*8*	*13.3*
International sources	*6.3*	*10.5*
Business sector	*8.9*	*14.8*
Other	*1.6*	*2.7*
Total	*24.8*	*41.3*

N/A – not available