

LITHUANIA

AIMING FOR A KNOWLEDGE ECONOMY



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Lithuania

Aiming for a Knowledge Economy

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List of Abbreviations

| | | |
|----------|---|--|
| ALL | - | Adult Literacy and Life Skills |
| BEEPS | - | Business Environment and Enterprise Performance Survey |
| CES | - | Citizenship and Education Study |
| CRA | - | Communications Regulatory Authority |
| EU | - | European Union |
| FDI | - | Foreign Direct Investment |
| FIAS | - | Foreign Investment Advisory Service |
| GDP | - | Gross Domestic Product |
| IALS | - | International Adult Literacy Survey |
| ICT | - | Information and Communications Technologies |
| IEA | - | International Association for Evaluation of Educational Achievement |
| ISP | - | Internet Service Provider |
| NGOs | - | Nongovernmental Organizations |
| INFOBALT | - | Information and Communications Technology Association in Lithuania |
| OECD | - | Organisation for Economic Co-operation and Development |
| PISA | - | Program of International Student Assessment |
| R&D | - | Research and Development |
| SBIR | - | Small Business Innovation Research |
| SMEDA | - | Lithuanian Development Agency for Small and Medium-Size Enterprises |
| TIMSS | - | Third International Mathematics and Science Study |

Lithuania Aiming for a Knowledge Economy

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Preface

The ability to acquire and use knowledge is increasingly important for countries' economic competitiveness. Moreover, the importance of knowledge for development will likely continue to grow—possibly making the difference between prosperity and poverty, both between and within countries. Acquiring and using knowledge require access to and the ability to use information and communications technology. But they also require efficient education systems that provide opportunities for life-long learning, new approaches to innovation that bring together researchers and entrepreneurs, and an economic and institutional framework that supports the use of knowledge to provide new and competitive products and services.

The knowledge-based economy—in a broad sense, embracing but going beyond information and communications technology—has been the subject of much discussion among international entities such as the World Bank, the European Commission, the Organisation for Economic Co-operation and the Development, and World Economic Forum. The implementation of concepts associated with the knowledge economy has also been part of policy debates at the national level, including in Lithuania.

European Union (EU) candidate countries have had varying success in adopting elements of a knowledge economy. Many have reformed policies and institutions to support national innovation systems and are striving to integrate with the European Research Area. Others are reviewing approaches to education, including tertiary education and training. All have agreed to implement a common “e-Europe+” action plan and are developing national strategies to address key areas of the knowledge economy. But in most EU candidate countries, including Lithuania, there remains scope for broadening the agenda for discussion and action from a knowledge economy perspective.

This report is intended to stimulate the ongoing debate in Lithuania on economic development from a knowledge perspective, and to help build consensus on how best to design, prioritize, and implement an agenda for modernization. In its efforts to develop a knowledge economy strategy and action plan, the Government of Lithuania requested World Bank support in performing a knowledge economy assessment. This report reflects work carried out by a World Bank team in collaboration with a Lithuanian Knowledge Economy Team coordinated by the Prime Minister's Office. It also reflects numerous comments and insights provided by various institutions, groups, and individuals in Lithuania in the course of reviewing a series of working papers and an earlier version of this report, covering the period from the first visit by the World Bank team in May 2002 through November 2002—including comments from a seminar on September 26, 2002 and final comments provided during discussions on November 26-28, 2002.

Summary: A Strategy for the Emerging Knowledge Economy

I. Knowledge is increasingly crucial for productivity, competitiveness, and growth. While Lithuania has a well-established culture of valuing knowledge, it is using its knowledge assets—human resources, education systems, researchers and entrepreneurs, and so on—below capacity, and so forgoing opportunities to compete internationally as well as potential growth and income.

II. In recent years Lithuania has made progress in a few areas of the knowledge-based economy, particularly in terms of improving the economic and institutional regime and developing infrastructure for information and communications technology. But less progress has been made on improving education systems, and Lithuania has performed poorly in advancing its systems for innovation.

III. The challenge for Lithuania is to develop new engines of growth and to diversify economic activities. Key to improving competitiveness are the systematic generation, use, and communication of knowledge throughout the economy and society—not just in high-tech sectors but also in areas such as textiles, wood processing, and agribusiness. And not just among the educated elite, but among the general population. The ability to network within and outside Lithuania, supported by Internet access, will become increasingly important to accessing and using knowledge.

IV. Given the time it takes to build consensus and implement policy changes, the time to start is now. Other countries are moving ahead with revised approaches to education, telecommunications regulation, and science and technology policies. Yet Lithuania is struggling with significant blockages to implementing the changes required for a knowledge economy. Mistrust between the public sector and businesses, poor communications between public institutions, and insufficient cooperation persist. Increasing partnerships among different social partners will be crucial for Lithuania to move ahead.

V. In addition to a sound macroeconomic framework, flexible labor markets, and effective social protection policies, a knowledge economy requires effective integration of education systems, innovation systems, and information and communications infrastructure. The proposals presented in this report form the core of an agenda that aims to support Lithuania's efforts to achieve a knowledge economy. These proposals can be grouped in six categories involving both policy measures and private initiatives.

➤ ***Improve collaboration between the business community and the public sector (including the research community and education institutions) by:***

- Linking the research and business communities more closely in developing and commercializing technical innovations.
- Providing the business community with a significantly increased role in formulating future innovation policies and programs.
- Increasing collaboration between the business community and the education sector through shared governance at the higher education level and participation in formulating education policies (among others, vocational training).

- Increasing the sophistication with which the private sector represents Lithuania's long-term business interests.
- Expanding the private sector's ability to compete and cooperate.
- ***Reform and support public institutions*** that are critically associated with a knowledge economy, including:
 - Establishing a ministry of the information society to consolidate strategy, policy, and monitoring functions currently spread across a number of public institutions. Coordination of the Government's knowledge management plans and e-government activities should be part of the ministry's mandate.
 - Strengthening the capacity of the Communications Regulatory Agency.
 - Strengthening innovation policy coordination through a Science and Technology Policy Council, with meaningful business sector participation in policymaking and a permanent secretariat.
 - Establishing a Lithuania Technology Agency to support the business community in technology research and development, dissemination, and commercialization; establishing this agency should involve merging a number of existing organizations with similar functions.
 - Consolidating state research institutions into a Lithuanian Institute of Technology with a mandate to undertake technology development on a research contract basis.
 - Identifying an institution able to establish and certify education equivalencies between formal education institutions in Lithuania and the European Union, and to address equivalencies between nonformal learning opportunities and formal education institutions.
 - Strengthening statistical systems for education, innovation and the information society, including benchmarking Lithuania against countries of key interest.
- ***Provide incentives for innovation, learning, and networking within the information society*** by reviewing old and introducing new fiscal support measures, including:
 - Reviewing the full range of education financing mechanisms (of which only a few are currently applied), particularly for tertiary education, with the aim of increasing efficiency, equity, and access.
 - Providing tax credits, learning vouchers, and the like to motivate enterprises and employees to invest in training.
 - Moving from institution-based funding of public research and development to program and project funding, thereby improving the relevance, efficiency, and accountability of resources spend on research and development while ensuring long-term funding for research activities.
 - Reassessing and possibly consolidating the broad range of support measures for small and medium-size enterprises (for example, under the above-mentioned Lithuania Technology Agency).
 - Introducing "smart subsidies" to support universal access to telephone and Internet services.

- ***Support labor market development***, thereby reducing unemployment in the medium term by reducing current and future skill gaps, by:
 - Defining and assessing the key competencies required for a knowledge economy.
 - Reviewing content for primary and secondary education and for vocational training.
 - Improving monitoring of labor market conditions.
 - Defining occupational standards as a basis for formulating training curriculums.

- ***Strengthen the regulatory framework*** in terms of:
 - The business environment (in particular, access to equity markets).
 - The telecommunications sector (local loop unbundling, authorization, inter-connection).
 - The information society (electronic transactions).

VI. The proposals outlined above and discussed in more detail in the report provide the core of an action program that would allow Lithuania to make progress in aiming for a knowledge economy. Implementation of such a program will require consensus and joint action among key actors:

- The Government, which will need to facilitate actions and integrate the aspirations of many stakeholders.
- The business community, which is the driver of innovation in the economy and will need to play a more substantive role in working with the Government to develop and implement policies for a knowledge economy, as well as direct activities in networking and promotion.
- The education and research communities, which will increasingly become the providers of demand-driven learning and research services.
- Civil society, as both a participant in and source of demand for products and services in the knowledge economy.

Lithuania **Aiming for a Knowledge Economy**

Challenges for Lithuania in Achieving a Knowledge Economy

1. Research and the recent economic success of many (often small) countries suggest increasingly strong links between knowledge and productivity, competitiveness, and economic growth. In Lithuania, strengthening these links and moving toward a knowledge-based economy require simultaneous progress on:

- Developing education systems and human resources to ensure that citizens are equipped to acquire, apply, and share knowledge.
- Establishing innovation systems that bring together networks of researchers and businesses to improve commercial applications of science and technology.
- Building an information society infrastructure that gives all people access to affordable and effective information and communications technology—supporting education, innovation, and networking.
- Providing an economic and institutional framework that ensures a stable macroeconomic environment as well as increased competition, flexible labor markets, and adequate social protection.

2. Since the early 1990s Lithuania—along with Estonia and Latvia, which have similar income levels—has experienced a remarkable economic turnaround relative to other countries that were part of the former Soviet Union, such as Belarus and Ukraine. Lithuania has completed the transition from a planned to a market economy and has largely adopted the *acquis communautaire* (the body of legislation of the European Communities and European Union), bringing it to the threshold of EU accession. In recent years economic growth has been strong, averaging 4-5 percent a year (except in 1999, due to the Russian Federation's financial crisis), and the macroeconomic environment has been stable. Strong growth has been driven by diverse and growing small and medium-size enterprises and by increasing exports of manufactured goods, facilitated by Lithuania's labor cost advantages.

3. Lithuania has also started to make progress on many of the elements required for a knowledge-based economy. For example, it has participated in EU research programs, prepared a white paper on science and technology, agreed to implement the eEurope+ action plan, adopted various information society and e-government strategies, and signed a memorandum of understanding on information society development between the private sector and the Government.

Challenges—Old and New

4. Yet Lithuania continues to face challenges associated with transition. Unemployment, which stood at 17 percent in 2001, is highest among lower-skilled workers. Poverty, which ranged from 10-25 percent of the population in 2000 (depending on the measure used), is concentrated in rural areas. And agriculture lags behind other sectors in terms of performance and growth. Agricultural activities need to be modernized, and the potential social costs of this

modernization can be eased by developing the rural business environment and supporting alternatives to farming. Many Lithuanians will measure the success of EU membership in terms of the economy's ability to achieve convergence between incomes in Lithuania and other EU member countries—convergence that is still many years away (World Bank 2002).

5. Lithuania will also face new challenges in the next few years. Competitive pressures will increase as Lithuania joins the EU and faces increased competition on the Single Market. Moreover, Lithuania's ability to compete based on the production of labor-intensive goods requiring few skills will become more difficult as wages rise with economic growth. Finally, the phase-out of the Multifiber Agreement in 2005 will lower the prices of textile and clothing exports from developing countries—putting pressure on Lithuanian manufacturers because textiles and clothing account for one-third of their exports to EU markets.

6. Lithuania has evolved enormously since achieving independence in the early 1990s. But the world has also changed considerably, creating opportunities as well as challenges. A new world economy is in the making, reflecting a technological revolution and an economic one (Rischarde 2002). The technological revolution, driven by plummeting costs of information and communications technology and increased codification of knowledge, has spurred technological developments in many fields, including biology, energy, nanotechnology, and new materials. Business and science have developed closer links—increasing innovation, shortening product life-cycles, and making education, worker skills, and lifelong learning more important than ever.

7. The economic revolution is being driven by powerful growth in world trade and international investment. Alliances between enterprises (including but going beyond joint ventures and mergers and acquisitions) have become crucial. In addition, value chains—the division of production and marketing functions among cooperating firms working across national boundaries—have become longer. More services are being supplied over greater distances, businesses are being reshaped from the ground up, and new product and service ideas are being generated.

8. Creativity and knowledge have become important factors of production in the new world economy, similar to capital, labor, land, and natural resources. Thus Lithuania must implement knowledge-supporting policies to increase its competitiveness and raise productivity.

Lithuania's Competitiveness

9. According to the *Global Competitiveness Report 2002/2003* recently issued by the World Economic Forum, Lithuania's current ability to compete internationally ranks 49th among 75 countries—well ahead of the Russian Federation and Ukraine yet placing Lithuania among the less competitive countries soon to join the EU. In terms of likely future competitiveness, Lithuania ranks 43rd, suggesting that current policies will slightly improve matters. Still, these rankings indicate that considerable improvements are needed if Lithuania's income convergence with current EU members is to accelerate.

11. According to the World Economic Forum, a country's current competitiveness is driven by two factors:

- The sophistication with which a country's companies compete—in terms of using sophisticated business strategies and moving away from advantages based on natural resources or low-cost labor (or both) to more distinctive products made using more productive methods.
- The quality of the business environment—in terms of the quality of input and factor markets, the competitiveness of the business environment, the extent of demand (in both domestic and export markets), and the presence of local support industries.

Lithuania's relatively low ranking based on these two elements points to the challenges ahead.

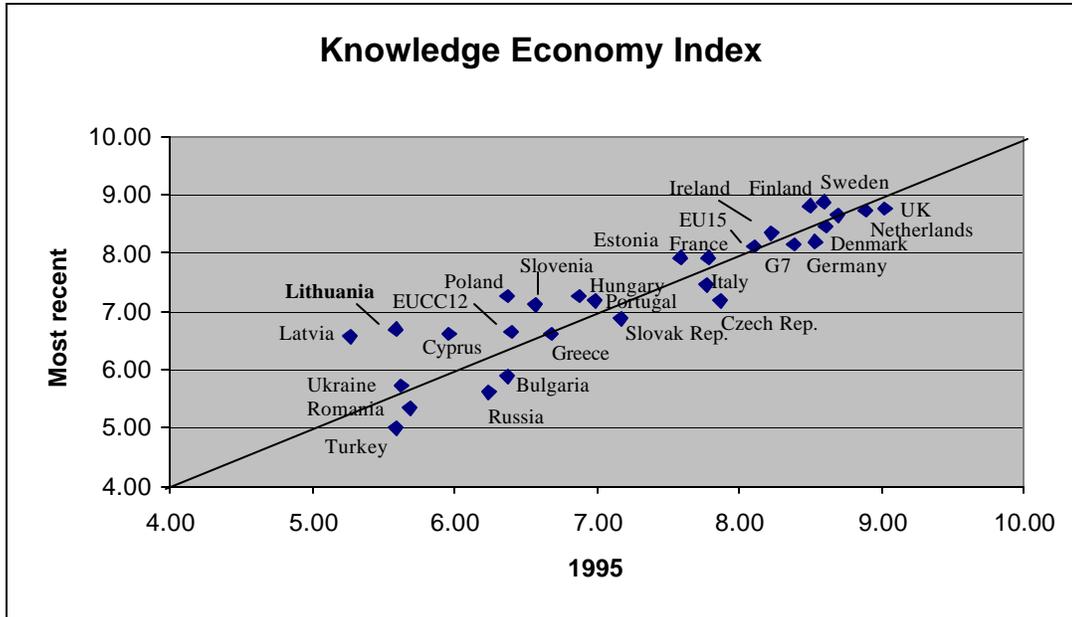
12. A country's future competitiveness, again according to the World Economic Forum, is largely a function of its ability to innovate (as indicated by a technology subindex, on which Lithuania ranks 41st—among the lowest of EU accession countries) and the quality of its public institutions (where Lithuania ranks 34th) and macroeconomic environment (where Lithuania's relatively low ranking – 56th – may have been influenced by the Russian Federation's financial crisis).

Progress toward a Knowledge Economy

13. Lithuania's relative progress in developing a knowledge economy was assessed using a benchmarking methodology developed by the World Bank Institute (for more information on the methodology, see www1.worldbank.org/gdln/kam.htm). Indicators were collected for 100 countries on three variables for each of the four main dimensions of a knowledge economy: education, innovation, information society (infrastructure), and economic and institutional framework. Countries were ranked on a scale of 0 (lowest) to 10 (highest) for each variable, then the 12 variables were averaged to produce a summary measure—the knowledge economy index.

14. Using this index, Lithuania made progress between 1995 and the most recent period (ranging from 2000 to 2002 depending on data availability), moving from a score of 5.6 to 6.7 (figure 1). This higher score places Lithuania ahead of the average score for EU candidate countries (6.6) and ahead of Latvia, Romania, Turkey and Bulgaria. Based on this index, Lithuania ranks behind the Visegrad Countries and Estonia, as well as the average score for EU member countries (8.12) and the G7 countries (8.17).

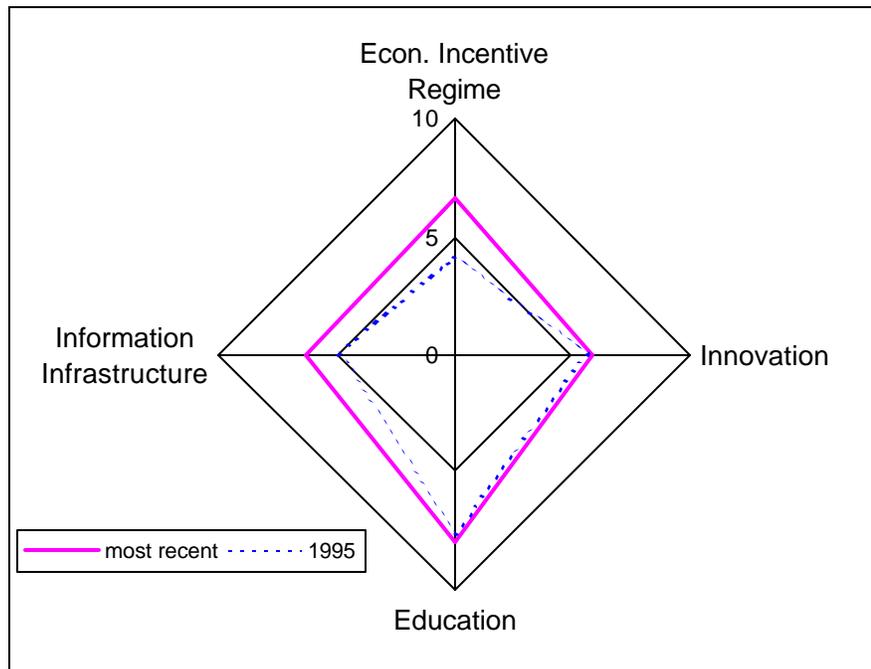
Figure 1: Scores on the knowledge economy index - various countries, 1995 and 2000-02



Source: World Bank Institute data

15. In terms of the four dimensions of a knowledge economy, Lithuania made the most progress in developing its information and communications infrastructure and improving its economic and institutional framework (figure 2). Less progress was made in improving education systems, though literacy and enrollment rates were already high in 1995. And when it came to fostering innovation systems, Lithuania's performance was poor.

Figure 2: Lithuania's performance in developing a knowledge economy, 1995 and 2000-02



Source: World Bank Institute data

16. Although Lithuania has a long-established culture of valuing knowledge, its actual and potential knowledge assets—human resources, education systems, researchers and entrepreneurs, and so on—are being underused in generating economic benefits. Thus opportunities are being lost in terms of boosting growth, incomes, and international competitiveness.

Where to Start—and When?

17. Lithuania has a small population (about 3.5 million people) and economy (\$11.3 billion GDP in 2000), resulting in a gross national income per capita of \$2,930. Moreover, it covers a small area (65,000 square kilometers) and has a narrow natural resource base. The country's main challenge is to diversify economic activities and develop new engines of growth. Key to improving competitiveness are the systematic generation, use, and transfer of knowledge throughout the economy and society—not just in high-tech sectors but also in traditional sectors such as textiles, wood processing, and agribusiness. And not just among the educated elite, but among the entire population.

18. With EU accession and significant amounts of EU structural financing becoming available in 2004, Lithuania has an opportunity to fund a broad range of public investments and programs to support a knowledge-based economy. This opportunity should be used to build broad consensus on the vision and steps to be taken in moving toward a knowledge economy—and on how to translate this vision into an action plan of well-defined, achievable programs and

projects supported by the EU. Given the time it takes to build consensus, implement policies, and achieve change, the time to start is now. Other countries, both in the region and elsewhere, are revising their approaches to and policies for education, telecommunications, and science and technology. The following sections describe areas and offer concrete proposals that Lithuania may want to consider in developing its action plan for a knowledge economy.

Lifelong Learning for the Knowledge Economy: Challenges for Education and Training

19. A knowledge economy requires as its foundation an educated, skilled population able to create, use, and share knowledge. Lifelong learning—from ages 4-80, in formal, nonformal (enterprise training), and informal (life experience) learning environments—is essential to this foundation. Learning in a knowledge economy can be seen from at least four perspectives:

- *A learner perspective*—as opposed to an education institution perspective.
- *An economic and labor market perspective*—but not in isolation from social and cultural factors.
- *An education policy perspective*—including reviewing key competencies required for the knowledge economy, fostering good governance of education institutions, financing human resource development, creating learning pathways and opportunities, and promoting equity and access across life stages and learning systems (formal, nonformal, informal).
- *A broader knowledge economy perspective*—linking education and human resource development to innovation systems and the information society.

20. Lithuania's education systems are at a crossroads. Though they face growing demands, they have limited capacity to respond to changing circumstances and enable lifelong learning. Moreover, resources to improve education access and quality are scarce. Governments at various levels and economic actors must transform formal education systems and link them with nonformal systems, improving overall performance. Responsibility for managing learning in the knowledge economy needs to be increasingly demand driven and based on individual needs, particularly as individuals move up the learning continuum. There is also a need to empower individuals to manage their learning, rather than placing full responsibility in the hands of education and training institutions.

21. Growth and decline in different sectors directly affects overall labor demand as well as demand for specific knowledge. Lithuania's transition years have seen a sharp shift in employment from the public to the private sector. In addition, employment has increased in services and decreased in agriculture, industry, and construction. As noted, much of Lithuania's high unemployment is due to workers' low or inadequate skills. If skills were improved, more people could get jobs and economic growth could accelerate. Education and training systems play a critical role in curbing the problem of low, narrow, and inadequate skills, including by changing the nature of vocational training in secondary education, increasing the effectiveness of tertiary education, and motivating individuals and enterprises to support nonformal training.

22. The following sections summarize key issues that need to be addressed and offer policy proposals that would facilitate lifelong learning and help overcome obstacles to the development of a knowledge economy—allowing all Lithuanians to fully participate in the knowledge economy in their country, in Europe, and in the global community. A full description of the issues and policy proposals is provided in annex 2.

Defining and Assessing Key Competencies

23. The content and delivery of Lithuania's education and training systems are being modified, particularly at the basic and secondary levels, to reflect emerging demands for skills and knowledge. But additional work is needed to identify the needs and assess the skills of students and workers.

Refining content

24. To refine the content and delivery of national programs, Lithuania's basic and secondary education policymakers and program designers should review international research on key competencies. An example is the "Defining and Selecting Key Competencies" project recently sponsored by the Organisation for Economic Co-operation and Development (OECD).

Increasing participation in international assessments

25. Lithuania should participate in additional international achievement assessments, specifically the OECD's Program of International Student Assessment (PISA) and the International Adult Literacy Survey (IALS). Doing so would provide benchmarks for youth and adult education and determine the degree to which Lithuanians have the core competencies required to function in a knowledge economy.

Restructuring vocational secondary schools

26. The 100 specialized programs in stage 3 and 4 vocational secondary schools should be cut to 15-20 broader career orientation programs that provide entry-level job skills, sufficient preparation for specialized postsecondary education and training, and a stronger foundation for lifelong learning in a changing labor market.

Responding to labor market demands

27. Monitoring of labor market demands should be expanded in two key areas. First, Lithuania should perform regular, qualitative, short-term economic and enterprise surveys like those done in Hungary and Sweden. Second, long-term human resource requirements should be modeled for various sectors based on national priorities for innovation and research.

Setting training and occupational standards and performing assessments

28. Efforts to set training and occupational standards and to perform assessments should be rapidly accelerated to strengthen links between training and the labor market and between formal and nonformal training. Training standards should cover high-priority occupations across the education spectrum—vocational, technical, and professional. Occupational standards should be established with input from the business and research communities.

Surveying graduates

29. All formal and nonformal education and training institutions—secondary schools, colleges and universities, labor training centers—that receive public funding should be required to perform annual surveys of a sample of graduates. Such surveys would help in evaluating the effectiveness of education and training programs, particularly in terms of their links to the labor market.

Addressing Governance and Management Challenges

30. Government education policies and programs should be more closely linked to the needs of businesses, particularly at the tertiary level of education and in the training system. Moreover, intellectual property rights in research and tertiary education should be more clearly defined.

Strengthening links between businesses and education and training efforts

31. Businesses should play a stronger role in governing tertiary education, with the authority to influence the actions and policies of boards of governors of tertiary education institutions—including the hiring of managers, the development of government education policies, and the creation of programs (for example, defining curriculums and operating joint programs such as internships, cooperative education, and research programs).

Improving intellectual property rights

32. Intellectual property rights should be clarified for faculty at higher education institutions to provide incentives to engage in applied and developmental research.

Financing Education

33. Given the rising demand for learning—and so for spending—several principles should guide the planning of future education financing. First, the acquisition of basic competencies, which increasingly means universal upper secondary education, should be publicly financed. Second, learning beyond basic competencies should increasingly be paid for by students and employers. Third, the Government should work to promote equity in education. Finally, education should be delivered more efficiently, particularly for the labor market.

34. Government financing of formal education and training in Lithuania is comparable to levels in countries with similar per-capita income, and appears to be functioning adequately. The new decentralized approach to financing basic education works on a per capita basis, is sensitive to differences between rural and urban areas, and makes provisions for special allocations (such as teacher in-service training). Still, several financing issues need to be addressed to increase efficiency, access, and equity in the face of rising demand.

Boosting efficiency

35. School mapping should be undertaken in primary, secondary, and higher education to examine the impact of the 40 percent decline in birth rate that occurred in the 1990s. This decline is starting to affect primary schools and will affect tertiary education in about 2009, requiring institutional consolidation. School construction should also be made more efficient, as Lithuania spends about twice as much on utilities as do Western schools in similar climates.

Adjusting tertiary education financing

36. Policymakers and the tertiary education community should consider implementing options to mobilize more resources per student, enhancing professional expertise in tertiary education management, reviewing policies aiming at phasing out and retaining academic staff, and increasing the financial power of higher education institutions.

Reviewing nonformal education financing

37. Alternative financing schemes—tax incentives, training levies, learning accounts, and so on—should be reviewed and selected options implemented to encourage enterprises to support and individuals to engage in adult and continuing education. Potential financial disincentives (such as taxes on training investments by individuals and enterprises) should be removed.

Opening Pathways Within and Between Learning Systems

38. Serious blockages in Lithuania's education and training systems inhibit the mobility of learners within the formal system and between the formal and nonformal systems, and block economic and social mobility and interdisciplinary learning.

Addressing blockages between formal education institutions

39. A third-party institution in Lithuania should evaluate and certify equivalencies between courses and programs in different institutions, and facilitate the mobility of learners within and between institutions of the formal education system.

Addressing blockages between formal and nonformal learning

40. There is a need to continue rapidly developing occupational standards and assessment instruments (see also above) to promote recognition of nonformal and informal learning, including by formal institutions such as colleges and universities.

Improving Equity, Access, and Motivation

41. Disincentives—and a lack of incentives—for individuals and enterprises to invest in education and training need to be addressed. (Some have already been cited above.)

Strengthening career guidance and counseling

42. Career services need to be further developed, particularly at the basic and secondary levels and in labor offices. In addition, there is a need to develop staff training at higher education institutions to prepare career guidance and counseling staff for education, training, and employment institutions, and for work in the personnel departments of private enterprises.

Motivating enterprises and employees to invest in training

43. To help overcome the low recognition and demand for adult continuing education, and to promote individual and enterprise investments in education and training, public information programs (such as adult learning weeks) should be enhanced. Financial incentives (tax credits, training levies, learning vouchers), better targeting of loan and scholarship funds, and increased recognition of informal and nonformal education and training, as discussed, would help improve equity, access, and motivation in education.

Lithuania's Innovation System: Connecting Researchers and Businesses

44. Innovation has a significant effect on productivity in firms, industries, and countries and so is essential to economic growth. But Lithuania's ability to innovate—that is, its ability to systematically generate, acquire, disseminate, and apply knowledge in new ways to solve problems and satisfy the needs of individuals and of society at large—is constrained. Lithuania has important elements of an innovation system, including universities, state research institutions, a business community, and a set of institutions aiming to support technology applications. But it has not managed to bring together these elements in a systematic way, in a coherent and coordinated framework able to link the research and development (R&D) community with the enterprise community. Many organizational structures follow and even reinforce old practices of separating rather than unifying the partners for innovation. Interaction among companies, research institutes, and universities is modest and occasional.

45. Though innovation occurs at the enterprise level, including some high-tech industries (laser technology, biotechnology), this has taken place in relatively few, isolated cases. The few success stories reflect Lithuania's potential for innovation rather than systematic use of knowledge assets. While some changes have been introduced to the national innovation system in recent years, partly driven by the consensus building associated with the science and technology white paper, much more needs to be done in terms of defining coherent innovation policies and establishing a supportive institutional framework that allows potential partners in innovation to join efforts in generating and applying knowledge for their benefit and that of the economy.

46. Small and medium-size enterprises play a crucial role in the Lithuanian economy. But medium-size and large firms, particularly those backed by foreign investors, have an advantage over small firms because they often have strong links to sources of knowledge and access to commercial banks and equity financing. In addition, subcontracting (between large international firms and smaller domestic firms) has important potential for firms in countries such as Lithuania. Small upstart companies that have trouble accessing finance and that lack access to networks need to rely on government technical assistance and financing as well as private equity financing with embedded technical assistance and management talent.

47. Small companies and foreign investors are particularly sensitive to the business environment. While foreign investors have a wide choice of countries to invest in, small and medium-size enterprises can remain in the informal sector in the absence of an adequate business environment. Several surveys of the business environment in Lithuania in recent years indicate that access to capital has become less of a constraint, while access to knowledge and to a skilled workforce is a growing concern.¹

¹ Foreign Investment Advisory Service (FIAS) – “Lithuanian Administrative Barriers” (1999); the World Bank & the EBRD - Business Environment and Enterprise Performance Survey (BEEPS) (1999); the World Bank – Lithuania, Country Economic Memorandum (2002)

48. As EU membership approaches, Lithuanian businesses face major challenges in adapting to EU regulations and standards. This adaptation will require significant investments in retooling and in process and management change to meet environmental, health, safety, and other standards. But adaptation also provides an opportunity to introduce innovative and more competitive technologies, processes, and management practices. Government policies and programs need to support this retooling as well as knowledge transfer and networking among firms and the research and education communities.

49. Today the R&D community operates largely in isolation from the private sector. Its output—in terms of publications, citations, patents, and licenses—is modest. There is an overemphasis on government-funded R&D, carried out and supported by a vast array of public institutions. Moreover, the research community is growing old and suffering from brain drain. In addition, funding instruments are outdated, focusing largely on institutional funding rather than more modern program funding. Too much funding goes to basic research, while too little is devoted to technology development and transfer. And modern R&D evaluation procedures are largely absent. Overall, innovation in Lithuania is hampered by the absence of a consistent innovation policy framework. The following sections outline key issues and proposals that are detailed in annex 3.

Formulating and Coordinating Innovation Policy

50. Current Lithuanian policies and institutions do not reflect the importance of innovation as a primary source of competitiveness in the global market. Though a white paper on science and technology has been issued, few actions have been taken—and those that have are not fully consistent with the paper. It is too early to evaluate the recently established Commission on Science and Technology, but without permanent staff and only occasional meetings the commission does not appear equipped to address the challenges ahead. The recently adopted Law on Higher Education and Science introduces some positive changes, but in general Lithuania's innovation systems are marked by an absence of meaningful goals, priorities for financial support (beyond the enumeration of selected themes), instruments that explicitly support R&D, and a long-term vision for a national innovation system. As a result much of the research undertaken to date is irrelevant to the business community.

51. The Commission for Science and Technology should develop into a Science and Technology Policy Council. This council should:

- Link the interests of businesses, researchers, and academic institutions.
- Ensure that research and education feed into the innovation process.
- Help improve Lithuania's competitiveness.

52. Council members would be nominated by the Government and include significant representation from the business and research communities. It would be chaired by the prime minister and include ministers from ministries with a major stake in R&D and innovations (Ministry of Higher Education and Science, Ministry of Economy, Ministry of Finance, Ministry of Interior). Building on the science and technology white paper, the Science and Technology Policy Council would:

- Prepare and agree on the vision, goals, and policies for long-term development of the national R&D and innovation system.
- Define specific policy instruments.
- Assess the implementation of the council's innovation strategies and policies on a regular basis.

53. These efforts would include analysis of the developments, needs, and objectives of the national innovation system, spell out policy instruments and funding tools (including sources and targets for R&D funding) for public sector research and technology development, and include recommendations for action by the private sector. To play this role, the council needs a secretariat with a full-time professional staff. The council would build consensus on basic guidelines for innovation policy, enhance business-research partnerships, and increase awareness about and visibility of the role of innovation. Experiences with this model in Estonia, Finland, and Ireland should guide the establishment of this high-level government institution.

Increasing the Relevance, Efficiency, and Accountability of Research and Development

54. The main challenge for the public R&D system is to increase its relevance, efficiency, and accountability. To do so, efforts must be made to:

- Significantly increase the flexibility of R&D financing.
- Improve the efficiency of R&D organizations.
- Upgrade professionalism in the management of funding.
- Increase demand for the research output of universities and research institutes.
- Promote cooperation between industry and research and academic institutions.

55. The Government should consider establishing a Lithuania Technology Agency to develop and implement new R&D funding instruments associated with revised innovation policies and priorities and working principles and processes for public R&D administration. In establishing such an agency, the Government should consider merging many of the public institutions currently supporting innovation and business activities, including the Lithuanian Center for Innovation and the Lithuanian Development Agency for Small and Medium Sized Enterprises.

56. The agency's main tasks should be to organize, finance, and evaluate new R&D in nationally significant fields of science and technology, serve as a contact point for EU-related R&D (including national management of EUREKA - Europe-Wide Network for Industrial R&D, COST - European Cooperation in the field of Scientific and Technical Research, and so on), and provide grants and loans to firms for innovation projects. Many of the agency's tasks will be new and will provide new thinking and orientation. But viable existing operations and resources should also be moved to the agency from the Ministry of Higher Education and Science and other places. The agency could be part of the Ministry of Economy or the Ministry of Higher Education and Science, but other approaches that provide more independence and credibility should also be considered. The experiences of countries such as Estonia, Finland, Ireland, and Sweden are relevant in this respect.

Consolidating Research Capacity

57. Lithuania has 26 state research institutes covering a broad range of specialized fields of research, from humanities to technology. This fragmentation of institutions is inefficient because each institution requires administrative support, aggravating the problem of scarce budgetary resources. Thus state research institutes should be reorganized. Recently some institutes have been integrated with Vilnius University.

58. The relevance of the research being performed is also in question. The institutes should consider shifting from basic to applied research, from budget-financed to contract and other externally financed research, and from ivory towers to institutions oriented toward supporting innovation for businesses.

59. To that end, the reorganization of state research institutes should be accelerated. One option would be to merge several institutes specialized in areas with potential for applied research and commercialization into a Lithuanian Institute of Technology. This institute would focus on applied technological research and contract research. The private sector should be invited to engage with the institute—not only as users of its expertise and services but also as owners, financiers, and contributors to the research.

60. Regardless of the new organizational arrangements, new funding mechanisms for state research institutes should be developed, with competitive contract research figuring prominently among sources of financing. The growth and development of the Lithuanian Institute of Technology would be driven by external financing (EU funds, funds from the National Technology Agency, contracts with firms) rather than by budget allocations. Similar arrangements exist in other European countries, as with Germany's Fraunhofer Institute.

Adjusting Funding for University Research

61. Nearly all university research is financed by the state budget, with resources allocated to universities in lump sums. Universities allocate these funds to departments largely based on established norms (based on the number of students and past allocations). This setup makes university research unresponsive to industry demand, because industry has no influence on university funding decisions.

62. To increase the relevance and accountability of university research, new funding mechanisms should be introduced that are incentive based, transparent, and flexible, with growing reliance on nonbudget financing. The mechanisms should clearly distinguish funds for education from funds for research. They should also allow for flexible use of external financing, including contract research and training. Finally, the mechanisms should allocate an increasing share of state budget funding based on performance—and eventually all funding should be allocated on this basis, with bonuses for exceptional performance.

Improving Data to Support Innovation

63. The poor quality of data on the Lithuanian innovation system means that there is no reliable database for long-term policy planning and decision-making or for ongoing monitoring and evaluation of performance. Thus R&D statistics should be upgraded to OECD standards (Frascati Manual), and innovation statistics should be developed to fulfill the requirements of the European Community Innovation Survey. R&D evaluation methods and mechanisms could be developed along the lines of those in countries such as Finland, Ireland, Norway, and Sweden. To support the accumulation of knowledge and experience on R&D and innovation-related analysis and studies, the Government should consider establishing a dedicated unit specialized in technology and innovation studies. This unit could be placed in the new Lithuania Technology Agency.

Fostering a More Supportive Business and Regulatory Environment

64. The business environment is not sufficiently supportive of innovation. In a recent survey firms reported increasing flows of foreign knowledge, and 27 percent indicated that access to the markets and technology embodied in foreign direct investment is critical. Only 16 percent cited a need for more capital as a primary concern. Ineffective, intrusive business regulations and licensing and tax regulations and enforcement are still major concerns, as are deficiencies in the legal system.

65. Steps should be taken to simplify business registration procedures, improve the legal framework, and streamline tax administration. Norms not required by the EU should be critically reviewed, questioning their necessity and value for public policy. More emphasis should be put on implementation to increase speed, transparency, and information flows.

Strengthening Business Support Programs

66. Many government programs and agencies provide business support—pursuing multiple objectives and often not effectively coordinated and administered. It is not clear that these programs boost innovation or further the knowledge economy.

67. Lithuania should undertake a systematic review of best practices used in other countries to design, operate, and coordinate business support programs aimed at fostering competitiveness, innovation, and growth. It is particularly important to review the multitude of dispersed subsidy programs such as loan, grant, and guarantee schemes, business innovation centers, technology parks and clusters, and industrial parks. Understanding the market failures that such programs are supposed to address, the business needs and management challenges they face, and the conditions under which they work well are critical to ensuring that they are sustainable in the long term. Enterprises participating in these programs require technical and managerial know-how to develop and commercialize their innovations. Lithuania should also consider merging some or all of its business support schemes under an umbrella organization such as the Lithuania Technology Agency.

Improving Access to Equity Funding

68. The legal framework for investment in Lithuania is geared toward equity finance for large, publicly listed companies and debt finance from commercial banks. Neither instrument is optimal for high-growth, early-stage, knowledge-based companies. Such companies are too risky for commercial banks because their cash flow is not predictable enough, and security against fixed assets is often not practical. In addition, the legal framework for private equity is not adequately developed, undermining the ability of outside investors and company managers and owners to provide incentives that align the interests of both parties. The instruments available for private equity investing are severely limited. Among other things, the legal infrastructure needs to allow provisions that facilitate investor exit from a company.

69. The forms of equity and quasi-equity possible under Lithuanian law should be brought in line with international best practices. Demand for these more sophisticated instruments appears to be growing as Lithuania's private equity industry matures. But faster legal reform could facilitate early-stage investments and catch the attention of international investors.

70. Local venture capitalists do not see shortcomings in the legal framework as a major constraint. But if Lithuania's investment industry is to mature and attract additional capital, international legal norms for private equity investing (and the corresponding regulatory and supervisory framework) will need to be introduced. A major provision used in other markets to help ensure an investor's ability to exit is the "liquidation preference," where investors have the right to the proceeds from a sale before managers and owners. This provision does not exist in Lithuania. Other provisions that can facilitate exit, such as those allowing majority investors to force other shareholders to participate in the sale of the company, are allowed.

Increasing the Private Sector's Role in Public Services

71. In industrial countries private organizations such as industry and employer associations have the capacity to formulate strategic proposals for the development of their industry and to review government proposals. Although these organizations represent the interests of their members, they often focus on long-term broad interests rather than the interests of individual firms. To do so, private organizations and their members must cooperate in developing policies and activities conducive to all businesses. Taking a broader, more strategic view allows the private sector to have more effective input to government policies and to launch initiatives of their own. Lithuania's private sector is far from developing such organization, cooperation, and outlook.

72. The Government, municipalities, and the private sector cooperate on specific projects such as business innovation centers, technology parks and clusters, and industrial parks. While in principle all serve as vehicles for the transfer of knowledge and technology and spur innovation, their success depends on how they are designed and managed. Many are developed without necessary preparation work to identify market needs and without adequate operating procedures and staffing. At best such entities provide education functions and survive mainly on state and international funds because enterprises are not willing or able to pay for the services provided.

73. Lithuania's private sector should adopt a higher profile in developing its vision and strategy for the knowledge-based economy—and in taking concrete steps to make that vision a reality. To do so, the private sector should develop organizations that gather information, analyze policy issues, and communicate with their members. It should also develop forums where representatives from all parts of the private sector can meet and formulate positions on policy issues. Doing so would improve the effectiveness of private sector partnerships with the Government that formulate visions, strategies, and policies for policymaking and of coordinating bodies for the information society and for innovation and education systems.

Mobilizing the Private Sector to Foster Competition and Cooperation

74. Entrepreneurship in Lithuania is struggling because networks to mentor and fund early-stage companies are still in early stages of development. Firms remain wary of outside investment, both local and foreign. Private investors often have little to offer beyond funding, and strategic investors (large companies) typically want complete control—leaving little role for the original management teams. In addition, cross-firm collaboration in areas such as marketing, promotion, and networking is scarce. Efforts by private associations and networking groups to address these problems remain limited—in terms of both sector coverage and depth of activities—particularly beyond the information technology and telecommunications sectors.

75. Private associations and networking groups should deepen their activities in support of members and extend their coverage across the knowledge economy in areas such as mentoring and networking for early-stage, high-growth businesses. Organized mentoring networks can help firms gain advice and support from experienced entrepreneurs. Private associations and groups should also engage in international promotion and marketing. To grow and compete, firms need strong ties to foreign markets and investors—and their knowledge. Private associations can play a key role in promoting and marketing Lithuanian companies and investment opportunities abroad.

Building an Information Society

76. The knowledge economy is a networked economy in which information and communications technology is crucial for economic growth, knowledge-based activities, and social inclusion and cohesion. Enterprises involved in information and communications technology are among the most innovative and dynamic in Lithuania, contributing to the development of a knowledge economy. Lithuania is a signatory of the e-Europe + program for EU candidate countries. The program aims to promote the development of an information society in EU member and candidate countries. The most recent progress report (June 2002) indicates a need for Lithuania to intensify efforts to achieve the agreed targets for the information society.

77. Lithuania is relatively rich in electronic and information networks, but these resources have not achieved their full potential. About 30 in 100 people have access to the fixed telephone network. In terms of total teledensity (fixed plus mobile), Lithuania lags behind its Baltic neighbors—a lag that becomes more pronounced when sector performance is disaggregated.

Building Regulatory Capacity in Telecommunications

78. The Lithuanian Communications Regulatory Authority (CRA) was established in the spring of 2001. Like all the new regulatory authorities in the region, it is at an embryonic stage, with little experience with a fully competitive market. Moreover, the EU recently adopted a new *acquis communautaire* that has not yet been applied extensively. The Lithuanian CRA faces the challenges of changing from a largely technical regulator to more of an economic regulator, acquiring the appropriate skills for these tasks, drafting the secondary legislation required by the new *acquis communautaire*, and implementing the new *acquis communautaire* in a relatively short period.

79. The CRA's ability to become an effective regulator will depend on the new telecommunications law, the duties assigned to it and other agencies, and the powers provided to it by the law. Its effectiveness will also be determined by the number of staff it hires, their skills, and the agency's ability to retain qualified staff. As with many other regulatory agencies in the region, there is a well-recognized need for technical assistance with building capacity and drafting secondary legislation.

Providing Universal Access to Telephones and the Internet

80. The development of Lithuania's information society is hindered by limited Internet access in general and by inadequate telecommunications access in rural areas. There are two main reasons for these access gaps. The first is a market gap—the inability of the market to provide access on a commercial basis, where private investment plays a key role. The second is a pure access gap—customers who cannot be supplied by the market for reasons of location or affordability, where public policy plays a key role. Lithuania's telecommunications market was liberalized in January 2003, which will enable it to start providing more complete access to commercial customers. But without changes in policy, the pure access gap will persist.

81. The pure access gap could be closed by designating operators to provide universal service in exchange for compensation from other market players or from the state budget for any financial losses. Alternatively, universal access to information and communications services—including the Internet—could be provided at public access points and telecenters in targeted communities. This approach could include “smart subsidies” and allow for local private or municipal participation in the operation of public telecenters.

82. Smart subsidies are a market-based solution that recognizes that such telecenters are not financially viable. When providing these one-time subsidies, the CRA and other relevant public institutions (such as community-based organizations) would solicit bids. The bidder seeking the smallest subsidy would then be obliged to provide a defined level of service over a specified period (say, 10 years). The subsidy would simply make each telecenter commercially viable: it would not be a 100 percent subsidy. When structured appropriately, such contracts can induce substantial private investment, and can even result in a higher level of service than the basic obligation.

83. Although disbursements of these one-time subsidies should be linked to performance criteria for the public access points, bidders should be allowed to make their own technological choices. Moreover, bidders may find that once the public access points are in place, additional commercially attractive customers can be reached in the territory for a small incremental cost. Bidders should take these potential commercial opportunities into account when calculating the required subsidy—further minimizing it.

84. These local solutions could be implemented through community-based service providers established by local authorities, businesses, banks, nongovernmental organizations (NGOs), or some combination of these. For instance, rural communities, entrepreneurs, and authorities could join forces to establish local telecommunications providers to bridge the access gap. These providers could then bid on subsidies in competition with other providers.

85. To test their viability and sustainability, such initiatives could be supported in their early stages by national or local governments. If community-based providers are to compete for subsidies with other providers, they should not be given other subsidies that would distort competition. Thus local government and community contributions should be expected to be recovered and earn a return in the long run. Furthermore, such initiatives could be linked to a broader agenda for local economic development, including efforts to promote education, training, health, e-government, and knowledge-based small and medium-size enterprises.

Unbundling Local Loops

86. Unbundled access to the local loop allows competing service providers to lease or rent the 'final mile' (local loop) to the premises of the customer and in this way to acquire additional customers. Unbundling of the local loop is provided for by Directive 2002/19/EC (the “Access” Directive). A question that needs to be addressed is whether unbundling provides sufficient financial incentives to the entity designated for unbundling its local loop.

87. The application of the unbundled local loop concept should be considered in the context of the policy goal of expanding access and achieving universal service over the next two or three years.

Addressing the Authorization Concept

88. The “authorization” concept of the EU *acquis communautaire* loosens the connection between a license and a territory. Licenses are usually awarded for distinct geographic areas, but in the authorization process a service provider chooses its territory—and may not serve what are perceived as unprofitable universal service customers. Thus Lithuania’s CRA needs to develop an innovative strategy to ensure universal service.

89. The regulatory challenge will be to provide sufficient incentives for telephone and Internet service providers to reach those currently not served. One approach would be to foster community-based service provision and partnerships between communities and service providers. This approach should be supported by technical assistance (to deal with the technological aspects) and assistance with the development of sustainable business plans. As part of these efforts, the CRA should undertake a study of the population lacking telephone services and issue licenses for the provision of universal service, with the licenses tied to specific locations and bidding for subsidies as described above.

Ensuring Efficient Interconnection

90. The interconnection of networks—of which there are many in Lithuania—is among the most important factors for competition in telecommunications. It is also an area characterized by frequent disputes. Interconnection involves commercial, technical, and operational arrangements. The disputes largely arise over commercial aspects: the fees that operators pay each other to termination or carry messages. Lithuania has a functioning interconnection market, but it will need to develop with the entry of new players.

91. For the market to fill the “market gap” and for the universal access approach to fill the “pure access gap,” close attention needs to be paid to resolving interconnection issues. It is proposed that the CRA provide for interim solutions, that where possible international benchmarks be used to determine interconnection fees, and that special consideration be given to Internet-related interconnection fees.

Consolidating Responsibilities for the Information Society

92. As with the innovation system, dispersed institutional responsibilities constrain effective leadership in formulating policies and planning, coordinating, monitoring, and evaluating activities related to the information society. Four public institutions share responsibilities for defining information society strategies and for making and implementing related policies. None of these institutions has the authority to coordinate and monitor policy implementation. As a result strategies and action plans for developing the information society largely remain at the design stage. Experiences from other countries that are successfully developing an information

society—such as Ireland and Slovenia—show that consolidating policy and implementation authority and technical capacity increases the effectiveness of policy actions.

93. Lithuania should consider consolidating into a new ministry the strategy, policy, and monitoring functions currently assigned to the Ministry of Transport and Communications, Ministry of Interior and Public Administration, Information Society Development *Commission*, Information Society Development *Committee*, and other institutions. This new ministry for the information society (a precursor of which existed until 1997) would be responsible for setting priorities for the development of an information society, formulating policies, planning actions, coordinating activities, and managing budgeting, financing, and procurement.

94. While line ministries would continue to be responsible for implementing programs and activities associated with the Government's Information Society Strategy, the new ministry would be empowered to coordinate, monitor, and evaluate implementation. It would also build consensus on policies for the information society, enhance government-business partnerships, and increase awareness and visibility of information society issues. The ministry would work closely with the proposed Lithuania Technology Agency. The staff and functions of the Information Society Development *Commission* would be moved into the proposed ministry. This model follows the approach taken in Slovenia.

Implementing Strategies and Action Plans

95. The absence of a coordinated, clear institutional framework hinders the implementation of strategies and action plans, including those for e-Europe + and other initiatives. The main policy document on the development of an information society is the "Lithuanian Information Society Development Strategy" prepared in 2000 by the Department of Information and Informatics of the Ministry of Public Administration Reforms and Local Authorities. That strategy defined the main goals of information society development over a three-year period:

- To use the opportunities offered by information and communications technology to support management of information, with the aim of improving people's quality of life, learning, and working and leisure conditions.
- To create information and communications technology infrastructure in compliance with EU standards.
- To create conditions for Lithuanians to learn and exploit the possibilities of modern information and communications technology.

96. The Information Society Development Committee has developed detailed action plans to complement the strategy, but implementation has been pending.

97. Lithuania should adopt a detailed consensus strategy for developing an information society, agreed with the main stakeholders at the policy and implementation levels. This strategy should go beyond a political vision and be backed by detailed action plans.

Promoting Knowledge Management, e-Government, and e-Business

98. Public and private sector knowledge management, supported by information and communications technology, is an important element of a knowledge economy. For an institution or company to manage knowledge well, there needs to be a systematic alignment of overall management and information management policies and processes, mindsets and cultures, organizational structures, technologies, budgets, and worker skills.

Coordinating public knowledge management

99. Lithuania's public sector is facing several challenges in implementing its knowledge management and e-government strategy. By far the most pressing concern is the need for credible, organized leadership to set priorities, develop action plans and monitor their implementation, and tackle cultural issues for knowledge sharing. Several stakeholders have emerged in the planning phase, but their roles are unclear and overlapping.

To address these issues, the Government should:

- Assign responsibilities for knowledge management and e-government policy, strategy, and monitoring to the proposed ministry for the information society (see above).
- Develop a knowledge management strategy and action plan to accelerate the integration of information systems within and among ministries, and to implement knowledge management systems within public institutions, with top-level political support.
- Encourage knowledge sharing in organizations and provide the incentives and environment for employees to do so. This recommendation is relevant not only within the public administration, but also for many businesses.

Enhancing knowledge management

100. There is a shortage of skilled technical and managerial staff to undertake knowledge management tasks. The education system does not produce the needed practical and theoretical skills. And because of low salaries, it is difficult to retain highly skilled technical staff in government institutions.

101. Links between the public administration and the education system should be created to provide formal and nonformal training on knowledge management. In addition, curriculums should be developed for training in knowledge management.

Strengthening the legal framework for electronic transactions

102. The absence of an adequate legal framework for electronic transactions hampers the provision of e-government and e-business services. Despite initial steps to harmonize domestic legislation with international standards for electronic transactions, Lithuania lags behind in passing relevant regulations.

103. The legal framework should be fully aligned with international standards to ensure that digital transactions (such as e-signatures) are possible and fully protected (for example, through e-commerce regulation). Lithuania seems to have fulfilled only a few of the formal requirements, and more efforts are needed to ensure full implementation of legislation governing Internet and electronic transactions.

Conclusion: Implementing the Knowledge Economy

104. Moving the frontier of Lithuania's knowledge economy across its four main dimensions will require consensus and joint action among key actors:

- The Government, which will need to facilitate actions and integrate the aspirations of many stakeholders.
- The business community, which is the driver of innovation in the economy and will need to play a more substantive role in working with the Government to develop and implement policies for a knowledge economy, as well as direct activities in networking and promotion.
- The education and research communities, which will increasingly become the providers of demand-driven learning and research services.
- Civil society, as both a participant in and source of demand for products and services in the knowledge economy.

105. In recent years the private sector has been instrumental in advancing the development of a knowledge economy. For instance, the importance of an information society has been brought to the fore by, among others, INFOBALT (an information and communications technology association in Lithuania) and, more recently, by two banks and two telecommunications service providers joining efforts in the Window to the Future initiative, which aims to improve access to information and communications technology by establishing telecenters. On the innovation policy side, the city of Vilnius, the Technical University of Vilnius, and the Knowledge Economy Forum (an association that includes high-tech companies) are aiming to develop a technology cluster in Vilnius. Other initiatives are being pursued by NGOs working at the regional level. These are promising steps and approaches that the Government should consider leveraging and scaling up.

106. Still, significant obstacles exist in the interactions among the key actors for Lithuania's knowledge economy. A legacy of mistrust, poor communication, and lack of cooperation persists. Many past and current initiatives have often stalled at the discussion stage, with little concrete action undertaken and few resources mobilized.

107. The proposals offered in this report are not necessarily new to many Lithuanians engaged in ongoing discussions on how to move forward. Indeed, many Lithuanian experts have in-depth knowledge of the issues at hand and an understanding of the available policy options. But what seems to be missing is consensus and leadership—whether from the Government or the business community—to move forward on the four main dimensions of a knowledge economy. The dispersion of responsibilities for the knowledge economy across ministries, agencies, and committees makes it very difficult to achieve such consensus. The resulting implementation of knowledge-related policies is slower than need be the case.

108. To succeed, a knowledge economy strategy needs to be implemented in an environment of:

- *Inclusiveness and partnerships.* A crucial first step is to build trust among a broad coalition of stakeholders, including the disadvantaged, the rural population, the business community, and education and research institutions—with the Government setting an example of good governance and taking leadership. As individuals become increasingly responsible for their lifelong learning, learners at all levels and from different income groups should have a voice in defining their learning demands and accessing learning opportunities. And as businesses become the main clients for science and research work, they will be key in shaping the science and technology agenda, supported by public resources.
- *Networking.* Much joint action will be required in moving forward. Fully inclusive networks involving diverse communities at all levels will increasingly become the drivers of a knowledge economy. Networking, supported by effective access to information and communications technology, will need to take place within and between municipalities but also with cities outside Lithuania, between research centers and enterprises, and between learning communities in Lithuania and abroad. Networking will need to develop at both the local and national levels, reaching across the Baltic states, the Nordic countries, the European Union, the Russian Federation and other members of the Commonwealth of Independent States, and beyond. As networks expand, driven by communities of interest and supported by ever-improving access to information and communications technology, old boundaries (physical, political, psychological) will dissolve.
- *Changing mindsets.* Moving toward a knowledge economy also requires a change in mindsets. For individuals, a knowledge economy requires becoming increasingly independent, adaptable, and responsible for one's actions. For businesses it requires the ability to systematically transform knowledge into products and services—and profits. For governments, it requires creating and supporting opportunities by challenging conventional policies and integrating partners to increase competitiveness. It also requires greater willingness and ability to share information with the public, emphasizing public services over public control, and supporting a national and inclusive dialogue that builds social cohesion and trust. Finally, the biggest challenge may be for the academic and research community—the harbor of knowledge in Lithuania—to rethink its role and approaches as it moves toward becoming a provider of knowledge services in response to demand, particularly from learners and from the business sector.

109. As noted, stronger data collections in education (participation in international assessments, labor market surveys), innovation (using OECD methodologies), and the information society (using the e-Europe approach) would improve policy analysis and formulation. Benchmarking Lithuania with countries of key interest would also aid policymaking. Benchmarking should include indicators that proxy change across the four dimensions of a knowledge economy and calls for a government commitment to publish and publicly discuss an annual knowledge economy progress report. In addition to greatly benefiting policymaking, a regular progress report on the knowledge economy would reflect a spirit of partnership in moving forward in Lithuania.

Annex 1: Challenges for Lithuania in Achieving a Knowledge Economy

1. Research and the recent economic success of many (often small) countries suggest increasingly strong links between knowledge and productivity, competitiveness, and economic growth. In Lithuania strengthening these links and moving toward a knowledge-based economy require simultaneous progress on:

- Developing education systems and human resources to ensure that citizens are equipped to acquire, apply, and share knowledge.
- Establishing innovation systems that bring together networks of researchers and businesses to improve commercial applications of science and technology.
- Building an information society infrastructure that gives all people access to affordable and effective information and communications technology—supporting education, innovation, and networking.
- Providing an economic and institutional framework that ensures a stable macroeconomic environment as well as increased competition, flexible labor markets, and adequate social protection.

A Changing World

2. Lithuania is a small country in terms of population (3.5 million people), size (65,000 square kilometers), and economy (\$11.3 billion in 2000), generating a gross national income per capita of \$2,930 in 2000. It also has a small natural resource base. Still, since the early 1990s Lithuania—along with Estonia and Latvia, which have similar income levels—has experienced a remarkable economic turnaround relative to other countries that were part of the former Soviet Union, such as Belarus and Ukraine. Lithuania has completed the transition from a planned to a market economy and has largely adopted the *acquis communautaire* (the body of legislation of the European Communities and European Union), bringing it to the threshold of EU accession. In recent years economic growth has been strong, averaging 4-5 percent a year (except in 1999, due to the Russian Federation's financial crisis), and the macroeconomic environment has been stable. Strong growth has been driven by diverse and growing small and medium-size enterprises and by increasing exports of manufactured goods, facilitated by Lithuania's labor cost advantages.

3. Lithuania has also started to make progress on many of the elements required for a knowledge-based economy. For example, it has participated in EU research programs, prepared a white paper on science and technology, agreed to implement the e-Europe+ action plan, adopted various information society and e-government strategies, and signed a memorandum of understanding on information society development between the private sector and the Government.

4. Against this positive backdrop, Lithuania faces a number of challenges. Competitive pressures will increase as Lithuania joins the EU and faces increased competition on the single market. The phaseout of the Multifiber Agreement in 2005 will reduce the price of textiles and clothing exports from developing countries to the European Union; because one-third of Lithuanian manufacturing exports to the European Union comprise textiles and apparels, Lithuanian exporters will face increasing competitive pressures. Finally, competing on the basis

of unskilled-labor-intensive goods will become increasingly difficult as wage levels in Lithuania rise with economic growth.

5. The economy is also faced with high unemployment (17 percent in 2001), concentrated among less-skilled workers. Poverty, ranging from 10-25 percent of the population in 2000 (depending on the measure used), remains widespread in rural areas. And modernizing the agriculture sector remains an important and unfinished agenda. The success of Lithuania's membership in the European Union will be perceived by many Lithuanians in terms of the economy's ability to converge Lithuanian incomes with those of other EU members—a convergence that is still many years away. Improving competitiveness and raising productivity through knowledge-supporting policies are thus key for Lithuania's future.

6. In addition, while Lithuania has evolved enormously since independence, the world has also changed over the past decade—often in unprecedented ways. A new world economy is in the making, driven by two forces: a technological revolution and an economic revolution. The technological revolution, driven by plummeting costs of information and communications technology and increased codification of knowledge has spurred the development of technologies in many other fields (such as biology, energy, nanotechnology, and new materials). This has been associated with closer links between enterprises and researchers, increased rates of innovation, and shorter product life cycles. This in turn has increased the importance of education, worker skills, and lifelong learning. Finally, investments in intangibles (in R&D, education, and software) in OECD countries are greater than investments in fixed capital.

7. The economic revolution is driven by a powerful expansion of world trade and cross-country investment. The economic revolution has led to faster, leaner production processes in which speed is key, driving shorter design and production cycles, shorter marketing loops, and shorter price cycles. Alliances between enterprises (including but going beyond joint ventures and mergers and acquisitions) have taken on central import, while value chains (the division of functions in production and marketing among cooperating firms working across national boundaries) have become longer. More services are being supplied over longer distances, businesses are being reshaped from the ground up, and new product and service ideas are being generated.

8. The new world economy (a concept going well beyond the new economy based on information and communications technology) provides for unprecedented opportunities as well as unprecedented stress. Opportunities are arising through new products, markets, and ways of doing things—and hold the promise of higher productivity growth and catch-up opportunities, particularly for smaller countries (which find it easier to reach a consensus to modernize). The flipside of this is the considerable stress for companies, governments, countries, regions, and individual citizens that will result from having to adapt to new rules that emphasize speed, networking, knowledge, and competitiveness. Given varying abilities to adjust, disparities are likely to grow both among and within countries.

9. With the advent of the new world economy, three new realities have also emerged with far-reaching implications for how economies will be managed in the future. First, with increasingly open economies and cross-border business venues, the ability of governments to

guide economic outcomes has been greatly reduced. Second, boundaries have become increasingly blurred between the roles of the public sector, the business community, and civil society in creating wealth and ensuring welfare. Finally, traditional top-down hierarchies are increasingly being challenged by networks of communities of interest, partly driven by the revolution in information and communications technology.

10. Within the new world economy, creativity and knowledge have become important factors of production, similar to capital, labor, and land and natural resources. An economy's ability to create, acquire, use, and distribute knowledge is becoming the key factor in determining its competitiveness. The importance of knowledge for development is likely to grow and could well come to mean the difference between prosperity and poverty.

Lithuania's Competitiveness

11. According to the *Global Competitiveness Report 2002/2003* recently issued by the World Economic Forum, Lithuania's current ability to compete internationally ranks 49th among 75 countries—well ahead of the Russian Federation and Ukraine yet placing Lithuania among the less competitive countries soon to join the European Union. In terms of likely future competitiveness, Lithuania ranks 43rd, suggesting that current policies will slightly improve matters. Still, these rankings indicate that considerable improvements are needed if Lithuania's income convergence with current EU members is to accelerate.

Table A1.1: Current Competitiveness Index Growth Competitiveness Index

| Country | Rank | Country | Rank |
|------------------|-----------|------------------|-----------|
| Finland | 1 | Finland | 1 |
| Ireland | 22 | Ireland | 11 |
| Hungary | 26 | Portugal | 25 |
| Estonia | 27 | Hungary | 28 |
| Portugal | 31 | Estonia | 29 |
| Slovenia | 32 | Slovenia | 31 |
| Turkey | 33 | Costa Rica | 35 |
| Czech R. | 35 | Greece | 36 |
| Slovak R. | 39 | Czech R. | 37 |
| Poland | 41 | Slovak R. | 40 |
| Latvia | 42 | Poland | 41 |
| Greece | 43 | Lithuania | 43 |
| Lithuania | 49 | Latvia | 47 |
| Costa Rica | 50 | Turkey | 54 |
| Russia | 58 | Romania | 56 |
| Ukraine | 60 | Bulgaria | 59 |
| Romania | 61 | Russia | 63 |
| Bulgaria | 68 | Ukraine | 69 |

Source: WEF, Global Competitiveness Report 2001/02

12. According to the World Economic Forum, a country's current competitiveness is driven by two factors:

- The sophistication with which a country’s companies compete—in terms of using sophisticated business strategies and moving away from advantages based on natural resources or low-cost labor (or both) to more distinctive products made using more productive methods.
- The quality of the business environment—in terms of the quality of input and factor markets, the competitiveness of the business environment, the extent of demand (in both domestic and export markets), and the presence of local support industries.

Lithuania’s relatively low ranking based on these two elements points to the challenges ahead.

Table A1.2: Current Competitiveness Index

| <u><i>Company Operations & Strategy Subindex</i></u> | | <u><i>Quality of Business Environment Subindex</i></u> | |
|--|-----------|--|-----------|
| Country | Rank | Country | Rank |
| Finland | 2 | Finland | 1 |
| Ireland | 17 | Ireland | 22 |
| Slovenia | 28 | Hungary | 25 |
| Estonia | 32 | Estonia | 26 |
| Hungary | 33 | Portugal | 29 |
| Costa Rica | 34 | Turkey | 31 |
| Latvia | 35 | Czech R. | 33 |
| Portugal | 38 | Slovenia | 35 |
| Czech R. | 41 | Slovak R. | 36 |
| Turkey | 44 | Poland | 40 |
| Lithuania | 47 | Greece | 42 |
| Greece | 51 | Latvia | 43 |
| Russia | 54 | Lithuania | 48 |
| Poland | 55 | Costa Rica | 52 |
| Slovak R. | 57 | Russia | 56 |
| Ukraine | 62 | Ukraine | 60 |
| Romania | 63 | Romania | 61 |
| Bulgaria | 70 | Bulgaria | 65 |

Source: WEF, Global Competitiveness Report 2001/02

13. A country’s future competitiveness, again according to the World Economic Forum, is largely a function of its ability to innovate (as indicated by a technology subindex, on which Lithuania ranks 41st—among the lowest of EU accession countries) and the quality of its public institutions (where Lithuania ranks 34th) and macroeconomic environment (where Lithuania’s relatively low ranking – 56th – may have been influenced by the Russian Federation’s financial crisis).

Table A1.3: Growth Competitiveness Index

| <u>Technology Subindex</u> | | <u>Public Institutions Subindex</u> | | <u>Macroeconomic Environment Subindex</u> | |
|----------------------------|-----------|-------------------------------------|-----------|---|-----------|
| Country | Rank | Country | Rank | Country | Rank |
| Finland | 1 | Finland | 1 | Finland | 1 |
| Estonia | 8 | Ireland | 18 | Ireland | 2 |
| Czech R. | 20 | Portugal | 25 | Greece | 32 |
| Hungary | 21 | Hungary | 26 | Portugal | 35 |
| Portugal | 25 | Estonia | 29 | Hungary | 38 |
| Ireland | 28 | Slovenia | 30 | Slovenia | 39 |
| Slovak R. | 29 | Lithuania | 34 | Costa Rica | 42 |
| Slovenia | 30 | Costa Rica | 37 | Estonia | 43 |
| Costa Rica | 32 | Slovak R. | 38 | Czech R. | 49 |
| Latvia | 34 | Greece | 40 | Poland | 50 |
| Poland | 35 | Poland | 41 | Lithuania | 56 |
| Greece | 38 | Turkey | 46 | Russia | 57 |
| Lithuania | 41 | Latvia | 48 | Latvia | 59 |
| Romania | 47 | Bulgaria | 51 | Slovak R. | 64 |
| Bulgaria | 50 | Romania | 52 | Romania | 67 |
| Turkey | 51 | Czech R. | 53 | Turkey | 68 |
| Russia | 60 | Russia | 61 | Bulgaria | 69 |
| Ukraine | 63 | Ukraine | 71 | Ukraine | 73 |

Source: WEF, Global Competitiveness Report 2001/02

Gradual Progress on the Knowledge Economy Agenda

14. How will Lithuania—the government, the private sector, and civil society—address the challenges of moving toward a knowledge-based economy? This report suggests that Lithuania consider pursuing policies (and policy reforms) and take actions in a broad range of areas that foster the creation, acquisition, use, and distribution of knowledge throughout the economy. The report also suggests that efforts be made at integrating and coordinating policy efforts more closely with the aim of supporting a knowledge economy. The areas for policy reform and integration touch on the four key dimensions of the knowledge economy:

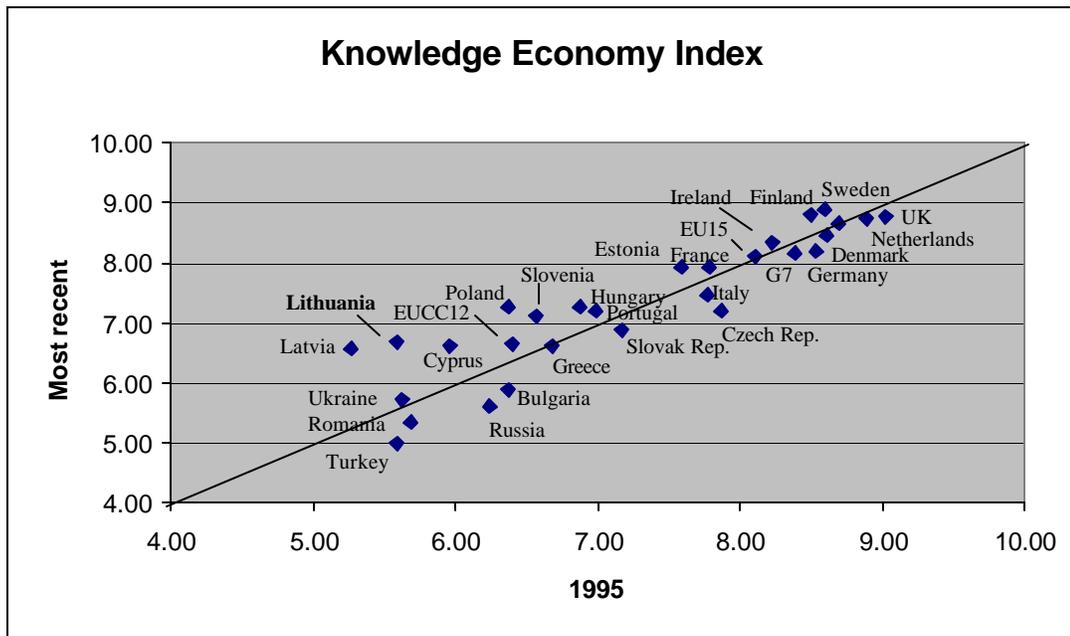
- Education systems that ensure an educated, skilled population able to create, acquire, use, and share knowledge.
- An innovation system comprising firms, research centers, universities, consultants, and other organizations capable of tapping into the growing stock of global knowledge and of assimilating and adapting this knowledge to local business needs—thereby creating new products and services.
- An information society that provides for dynamic information and communications infrastructure to facilitate the effective communication, dissemination, and processing of information.
- An economic and institutional regime that provides incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship. Good governance in both the public and private sectors is key to establishing such a regime.

Benchmarking the Knowledge Economy

16. Lithuania's relative progress in developing a knowledge economy can be assessed using a benchmarking methodology developed by the World Bank Institute (for more information on the methodology, see www1.worldbank.org/gdln/kam.htm). Indicators were collected for 100 countries on three variables for each of the four main dimensions of a knowledge economy: education, innovation, information society (infrastructure), and economic and institutional framework. Countries were ranked on a scale of 0 (lowest) to 10 (highest) for each variable, then the 12 variables were averaged to produce a summary measure—the knowledge economy index.

17. Using this index, Lithuania made progress between 1995 and the most recent period (ranging from 2000 to 2002 depending on data availability), moving from a score of 5.6 to 6.7 (figure 1). This higher score places Lithuania ahead of the average score for EU candidate countries (6.6) and ahead of Latvia, Romania, Turkey and Bulgaria. Based on this index, Lithuania ranks behind the Visigrad Countries and Estonia, as well as the average score for EU member countries (8.12) and G7 (8.17).

Figure A1.1: Knowledge economy index: scores for various countries, 1995 and 2000-02

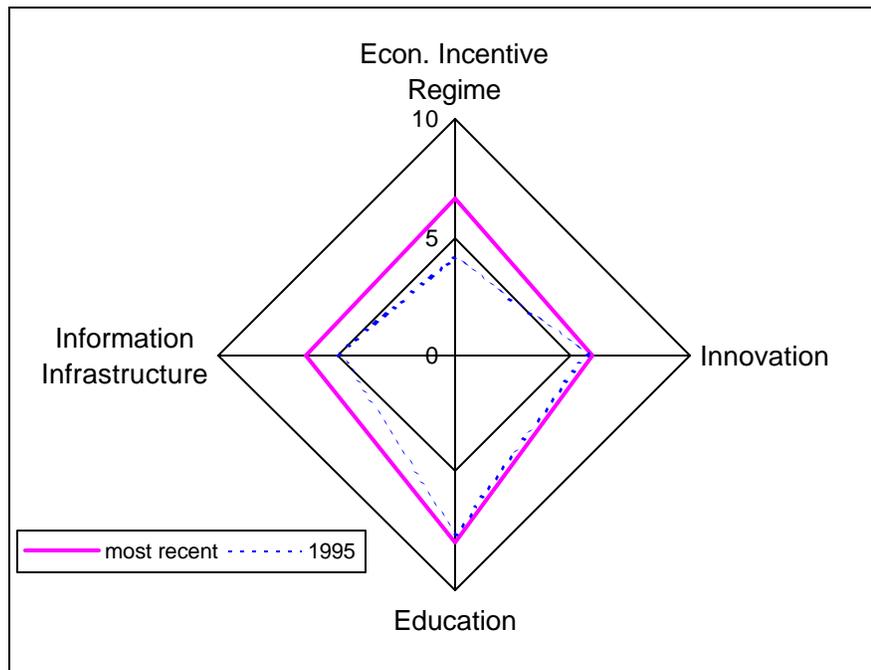


Source: World Bank Institute data

18. In terms of the four dimensions of a knowledge economy, Lithuania made the most progress in developing its information and communications infrastructure and improving its economic and institutional framework (figure A1.2). Less progress was made in improving

education systems, though literacy and enrollment rates were already high in 1995. And when it came to fostering innovation systems, Lithuania's performance was poor.

Figure A1.2: Lithuania's performance in developing a knowledge economy, 1995 and 2000-02



Source: World Bank Institute data

19. So, despite significant progress, considerable challenges—new and old—will mark the way for Lithuania's ability to achieve a knowledge economy able to compete with other EU candidate countries and current members, and to find its place in the global economy.

20. To support formulation and integration of policies that foster a knowledge-based economy, this report suggests that Lithuania develop within its Statistical Office a system of indicators that allows it to monitor progress on the four key dimensions of the knowledge economy (see above) and that allows Lithuania to benchmark its progress against relevant comparator countries. Benchmarking Lithuania with countries of key interest would also help guide policy. Benchmarking includes:

- Designing indicators that proxy changes across the four dimensions of the knowledge economy, allow for comparisons with key countries of interest, and are aligned with major EU and OECD tracking tools.
- Establishing relevant data collection procedures and databases within the Statistical Office.

- Securing the Government's commitment to publish and publicly discuss an annual progress report on the knowledge economy. This Report could be issued under the aegis of the prime minister.

When to Start?

21. With EU accession and significant amounts of EU structural financing becoming available in 2004, Lithuania has an opportunity to fund a broad range of public investments and programs to support a knowledge economy (box A1.1). This opportunity should be used to build broad consensus on the vision and steps to be taken in moving toward a knowledge economy—and on how to translate this vision into an action plan of well-defined, achievable programs and projects supported by the European Union. Other countries, both in the region and elsewhere, are revising their approaches to and policies for education, telecommunications, and science and technology. Given the time it takes to build consensus, implement policies, and achieve change, Lithuania must start now in developing its action plan for a knowledge economy.

Box A1.1. EU structural funds

To secure funding for a broad range of public investments under forthcoming EU structural funds, Lithuania is preparing a draft of its Single Program Document, to be negotiated with the EU Commission in the course of 2003. The document will outline guidelines and criteria for investments eligible for funding under the EU funds across a broad set of themes. The drafting of the document is being coordinated by the Ministry of Finance with the support of 12 government committees. More than half of these committees work on areas directly relevant to the development of a knowledge economy (information society, professional training, employment, education, science and technology, telecommunications, local infrastructure, social affairs). Thus EU structural funds could become an important funding instrument for the knowledge economy—provided that programs can be identified and properly designed and implemented. An important task for policymakers and implementing institutions will be to guide the formulation and implementation of such programs. In addition, developing the Single Program Document with a knowledge perspective in mind could lead to the design of a broader action plan for Lithuania's knowledge economy.

[http://europa.eu.int/public-services/european union/enterprises/funding_opportunities/structural_funds \(esf\) en.htm](http://europa.eu.int/public-services/european union/enterprises/funding_opportunities/structural_funds (esf) en.htm)

Annex 2: Lifelong Learning for the Knowledge Economy: Challenges for Education and Training

1. Key issues need to be addressed to facilitate lifelong learning that allows Lithuanians to participate more fully in the knowledge economy in their country, in Europe, and in the global community. This annex does not include a detailed narrative and statistical description of Lithuania's education sector, as those have already been documented in many other publications. Rather, the intent here is to add value by focusing on the linkages within and between lifelong learning and the knowledge economy, and to identify areas where Lithuania may want to consider implementing learning policies that help overcome obstacles to development.
2. This annex considers the linkages between learning and the knowledge economy from three perspectives:
 - *A learner perspective*, as opposed to an education institution perspective.
 - *An economic and labor market perspective*, though not in isolation from social and cultural factors.
 - *A thematic education policy perspective*, which examines learning and knowledge issues across different life stages—from early childhood to retirement—and learning systems—formal, nonformal (that is, training in enterprises), and informal (that is, life experiences).
3. Globalization and the knowledge economy have created monumental economic and technical changes, posing enormous challenges to formal and nonformal education systems worldwide—particularly if they are to respond to enable lifelong learning. Knowledge has become a fundamental driver of progress. The resulting urgency to generate, use, and disseminate knowledge requires adjusting the systems and processes that create and use it.
4. In many countries, including Lithuania, education systems are at a crossroads—facing increasing demand but with limited capacity and resources to improve access and quality. The increasing economic importance of knowledge and innovation, growing reliance on technology, and rising demand for traditional as well as new skills signal that globalization is not just a means of production but also a means of education. Recent research indicates a need to broaden the base of basic skills to include information, communication, and language competencies. Such research also points to the need to introduce new skills and knowledge, including those that allow individuals to evaluate and use knowledge, to act autonomously in increasingly complex social and work environments, and to join and function in socially heterogeneous groups (OECD 2001 b). All individuals need access to learning on a lifelong basis, which requires policies that facilitate more responsive learning systems.
5. With the global economy increasingly driven by knowledge, countries need educated populations able to create, adapt, use, and disseminate it. Thus governments and economies must transform formal education systems and link them with nonformal systems, with the goal of creating an overall high-performance learning system. The key challenge for education is to provide individuals with access to necessary knowledge and skills. But other questions also arise. How should knowledge be imparted if the kind of knowledge in demand is constantly

changing? How should the new demands on the education sector be managed? And how can countries mobilize the financial resources necessary to confront these enormous challenges?

6. Education systems in OECD countries have been adjusting to these changes more quickly than systems in developing countries, yet developing countries face even greater challenges. First, they must overcome long-standing problems: expanding coverage to achieve universal access to basic education (a necessary but insufficient first step in providing skills for the knowledge economy), expanding secondary and tertiary education, and implementing institutional reforms to strengthen the linkages between formal and nonformal education and the labor market. Second, developing countries need to raise the quality of education through changes to content, pedagogy, and the use of modern technologies, as well as cost-effectively expand access to postschool learning for adult learners. How developing countries respond to these challenges will affect economic growth, human capital development, and social cohesion.

Learner Perspective

7. The responsibility for managing learning in the knowledge economy needs to be increasingly demand driven and based on individual needs, particularly as individuals move up the learning continuum. There is a need to empower individuals to manage their own learning, rather than placing full responsibility in the hands of education and training institutions. This paradigm shift reflects the need for individuals to have basic knowledge as well as knowledge of how to access, select, and evaluate specialized knowledge—and to use it autonomously in the context of lifelong learning in a knowledge economy.

8. This trend is increasingly reflected in the literature from both industrial and developing countries as well as multilateral and bilateral discussion papers. The World Bank's Human Development Network recently completed a systematic review of the implications for developing countries of lifelong learning and the knowledge economy. The review cites research that an educated, skilled population capable of creating, using, and sharing knowledge is one of the four pillars of a knowledge economy (World Bank 2002).

9. In a discussion of the transition from education to working life, OECD (2000) portrays the process as involving two types of approaches. First, structural approaches that focus on the institutional frameworks of education and training systems. Second, approaches that focus on learner-centered activities, concentrating on teaching and learning processes. The two are not seen as mutually exclusive but rather as complementary—and needing to be developed in tandem.

10. The EU indicates that the principles that increasingly underpin learning and guide its effectiveness must emphasize the centrality of the learner (Commission of the European Communities 2001). The International Labour Organization describes the paradigm shift in a similar way as involving a move from training and focus on the teacher to self-learning and focus on the learner; from one-time learning to recurrent lifelong learning; and from supply-to demand-driven approaches (ILO 2002).

11. If one agrees with the basic premise that individuals need to be increasingly responsible for managing their learning, particularly as they advance through different life stages, then a number of challenges emerge.

- What key competencies does an individual need to operate in a modern knowledge economy, and how should they be measured, benchmarked, and assessed?
- What challenges do education and training institutions face in shifting the management of learning to individuals?
- How can individuals be motivated to take increased responsibility for learning?
- What information do individuals need to facilitate an increased role in planning their learning?
- What challenges do formal education and training institutions face in supporting demand-driven training?
- What are the difficulties in recognizing nonformal learning?
- What unique challenges do developing countries encounter when facilitating demand-driven learning?

These questions are addressed in this annex from the perspective of helping individuals manage learning throughout their lifetime.

Economic and Labor Market Perspective

12. The economic literature affirms the importance for economic growth of investment in human capital. Growth (or decline) in specific sectors directly affects labor demand as well as demand for specific knowledge. As a knowledge economy develops, shifts in employment occur, including increased employment in knowledge-intensive sectors and increased use of information and communications technology. These shifts are apparent in Lithuania, causing structural changes in labor demand—with ramifications for education and training systems.

Employment by sector

13. As elsewhere in Central and Eastern Europe, Lithuania's transition years have seen a sharp shift in employment from the public to the private sector. In 1991 the private sector employed less than 30 percent of Lithuanian workers; by 2000 it employed nearly 70 percent. Much of this growth occurred in small and medium-size enterprises, which in 1998 accounted for more than 55 percent of the workforce—twice the level just five years earlier.

14. In addition, since the early 1990s there has been an increase in services jobs and a decline in industrial and construction jobs, with agriculture playing a buffer role (table A2.1). Many workers laid off in industry had trouble finding new jobs in urban areas and so moved to rural areas to take up farming. Many of these migrants were elderly, low-skilled workers. This urban-rural migration increased agricultural employment from 18 percent of the workforce in 1991 to 23 percent in 1994. Since 1994 employment has continued to shift from industry to services, but agricultural employment has fallen as well, to 21 percent of the workforce in 2000. During the same period the share of industry fell to 20 percent—while the share of services rose to 54 percent in 2000.

Table A2.1: Composition of Employment (percent)

| <i>Sector</i> | 1993 | 2000 | Change |
|---------------|------|------|--------|
| Industry | 25 | 20 | 5 |
| Construction | 7 | 6 | -1 |
| Agriculture | 23 | 21 | -2 |
| Services | 45 | 54 | 9 |

Source: Lithuanian Dept. of Statistics.

Level of employment

15. Despite positive GDP growth and strong export performance, employment has remained largely stagnant, with employment in 2000 slightly lower than in 1995. This phenomenon of “jobless growth” is not specific to Lithuania; but typical of most transition economies in Central and Eastern Europe. The primary reason for economic growth not coupled with employment growth are productivity improvements associated with intensive restructuring. Growth in labor productivity (measured as GDP per worker) has been quite strong since 1996, averaging 4 percent per year. Thus economic growth in Lithuania has been achieved through more efficient use of labor resources rather than through increased use of labor inputs.

16. A deeper reason for the jobless growth in Lithuania, and in transition economies generally, is the process of overcoming the legacy of overstaffing inherited from the previous system. Many companies entered the transition with employment far above that justified by production requirements. Growing exposure to domestic and international competition coupled with an influx of new and more capital-intensive technology has led companies to rationalize employment and shed labor. This process has been spread over time. Although the destruction of unproductive jobs has been accompanied by the creation of new and more productive jobs, job losses have exceeded job gains, causing a net fall in employment.

Nature of unemployment

17. An analysis of the relationship between unemployment and job turnover suggests that intensive restructuring may have contributed to high unemployment, but it has done so indirectly through the emergence of frictional unemployment (that is, workers have the right skills but are in the wrong location or do not know where the jobs are) and structural mismatches (that is, workers do not have appropriate skills) in the labor market. High job reallocation need not be associated with high unemployment, because high turnover usually means that the unemployed have a good chance of finding a new job, and hence unemployment spells are short. It is thus possible to have a high job destruction rate and low and short unemployment rates (as in the United States). The requirement for this to happen is a high degree of labor mobility (in terms of geography and skills).

18. But in Lithuania there appear to be severe limitations in mobility from old to new jobs. The jobs being destroyed differ in salient ways (especially in terms of geography and skills) from those being created. As a result many workers that have lost jobs do not have the right

knowledge to take up new ones. This leads to longer unemployment and has contributed to the buildup of a pool of long-term unemployed. Since long unemployment is often associated with loss of skills and motivation, many of the long-term unemployed may have become marginalized and even less able to benefit from the high job creation rate.

Skills gap

19. The skills gap seems to partly account for the limited transitions from unemployment into jobs. On average, the unemployed, and especially the long-term unemployed, have lower education attainment and lower skills than the employed. Half of the workforce has a secondary or less education and an unemployment rate twice that of postsecondary graduates. The unemployment rate among workers with less than upper secondary education is around 25 percent, compared with 6 percent among workers with university education (table A2.2).

20. The skill mix is of some concern to Lithuanian employers, especially as the size of an enterprise increases, as indicated in the 1994, 1997, and 2001 Private Enterprise Surveys. Employers indicated a moderate but increasing concern about the availability of skilled workers and technicians, and the impact this has on the operation and expansion of businesses. If the skills gap could be reduced, economic growth could accelerate and more people could be put to work. The skill mismatch problem has two policy implications:

- First, it indicates the need for greater wage flexibility, especially at the lower end of the wage distribution, to encourage the creation of low-skilled jobs and improve the employment prospects of poorly educated unemployed.
- Second, it points to the role of education and training systems in curbing the problem of low, narrow, and inadequate skills—including changing the nature of vocational training in secondary education, examining the proportions of enrollments between colleges and universities, and motivating individuals and enterprises to support nonformal training.

Table A2.2: Unemployment and Employment by Education Level, 2000 (percent)

| <i>Level of Education</i> | <i>Unemployment Rate</i> | <i>Share in Unemployment</i> | <i>Share in Employment</i> |
|----------------------------|--------------------------|------------------------------|----------------------------|
| University | 5.9 | 7.2 | 20.9 |
| College | 13.6 | 21.7 | 25.0 |
| Upper Secondary General | 17.3 | 23.1 | 20.0 |
| Upper Secondary Vocational | 18.6 | 22.2 | 17.7 |
| Lower Secondary General | 26.2 | 14.9 | 7.6 |
| Lower Secondary Vocational | 24.0 | 8.7 | 5.0 |
| Primary or less | 9.3 | 2.1 | 3.8 |
| | 15.4 | 100.0 | 100.0 |

Source: Labor Force Survey Data, Lithuania Dept. of Statistics, and World Bank staff calculations.

Thematic Education Policy Perspective

21. Several indicators set the stage for a discussion of key education policy themes. The indicators show that in a number of areas Lithuania generally follows trends in transition and developing countries (as in terms of public spending on education, primary and secondary education enrollments, and adult literacy). But there are several areas where Lithuania deviates from the norm: for example, unemployment is significantly higher, mathematics and science scores for 8th graders are lower, and management training and adult continuing education are less widely available (table A2.3). These deviations indicate shortfalls in basic and tertiary education as well as potential problems in adult continuing education for the current workforce. The latter deficiency contributes to long-term structural unemployment and a shortage of human capital to support development of the knowledge economy.

Table A2.3: Selected Knowledge Economy Indicators related to Human Development

| <i>Indicator</i> | <i>Lithuania</i> | <i>Europe and Central Asia</i> | <i>United States</i> | <i>Western Europe</i> | <i>G7</i> |
|---|------------------|------------------------------------|--------------------------|---------------------------|--------------|
| <i>Unemployment Rate (percent)</i> | 13.50 | 9.80 | 4.50 | 7.75 | 8.11 |
| <i>Human Development Index</i> | 0.80 | 0.79 | 0.93 | 0.93 | 0.93 |
| <i>Public Spending as % of GDP</i> | 5.20 | 4.86 | 4.70 | 6.08 | 4.99 |
| <i>Primary Student- teacher Ratio</i> | 15.00 | 17.23 | 16.00 | 14.00 | 16.83 |
| <i>Secondary School Enrollment (percent)</i> | 90.00 | 83.33 | 97.00 | 116.00 | 109.14 |
| <i>8th Grade Mathematics Achievement</i> | 482.00 | 510.89 | 502.00 | 530.00 | 517.40 |
| <i>8th Grade Science Achievement</i> | 488.00 | 519.67 | 515.00 | 545.00 | 525.80 |
| <i>Gross Tertiary Enrollment 1995 (percent)</i> | 41.00 | 39.06 | 81.00 | 56.75 | 59.57 |
| <i>Adult Literacy (percent)</i> | 99.50 | 97.56 | 99.00 | 98.83 | 99.00 |
| <i>Availability of Management Training</i> | 4.00 | 4.15 | 6.70 | 5.70 | 5.74 |
| <i>Prof/Technical % of workforce</i> | 21.37 | 20.86 | 28.50 | 27.34 | 24.86 |
| <i>Extent of Staff Training</i> | 3.40 | 3.65 | 5.90 | 5.65 | 5.47 |
| <i>Computers per 1,000 people</i> | 4.09 | 4.09 | 6.24 | 5.87 | 5.69 |
| <i>Telephones per 1,000 people</i> | 5.77 | 5.52 | 6.55 | 6.39 | 6.40 |

Source: World Bank Institute, World Bank.

22. The rest of this annex examines six cross-cutting education policy themes:

- *Defining and assessing key competencies.* What competencies are needed to function effectively in a modern democratic knowledge economy? How should they be addressed by different components of the education system? What changes in educational pedagogy are needed? And how should these competencies be measured and benchmarked?
- *Governance and management challenges.* What role should be played by key stakeholders (civil society, the public sector, the private sector)? What impact does decentralization have on governance and management, and how can national regulatory roles be balanced with local autonomy?
- *Financing.* What should be the guiding principles for allocation of funds within and between learning systems (formal and nonformal)? What is the role of public and private financing at different levels of education and in different learning systems, and how can resources be reallocated and used more efficiently in different parts of the education system?
- *Opening pathways within and between learning systems.* What are the constraints to mobility within and between different learning systems (formal, nonformal, and informal)? What incentives and mechanisms can be used to help overcome constraints and improve access to learning at different life stages? What existing and new institutional arrangements are most effective in facilitating access to learning services?
- *Equity and access.* How can equity, access, and affordability of lifelong learning for the poor and vulnerable be improved? What mechanisms should be used to facilitate “second and expanded chance” learning for those who do not receive sufficient initial education to function in the knowledge society or who want to move up a career ladder? How can the motivation for learners to engage in lifelong learning be increased? How can Lithuania attract and retain more and better people into education and training sector, including addressing issues of brain drain?
- *Research and knowledge generation.* How can education, science, technology, and research be linked more effectively?

23. These themes are discussed with respect to two aspects of lifelong learning. First, learning that occurs from early childhood, to youth, to adulthood and retirement. Second, learning that occurs in three different, and sometimes overlapping, education systems—the formal system (primary, secondary, tertiary), the nonformal system (enterprise training, short-term labor market training), and the informal system (sometimes provided by civil society, life experience).

Defining and Assessing Key Competencies

24. The key question is, what competencies are needed to function effectively in a modern democratic knowledge economy? Moreover, how should they be reflected in the content of the learning system, and how and when should they be transmitted? While the content and delivery

of education and training systems in Lithuania, particularly at the basic and secondary levels, are being modified to reflect emerging skill and knowledge demands, additional work is needed.

25. Lithuanian stakeholders discussed these during the consultation on lifelong learning, which was completed in cooperation with the EU (Ministry of Education and Science 2001). This and other consultations have resulted in a significant reworking of the basic education curriculums (grades 1-10), which is now supported by a World Bank project; initial work on revamping secondary education, including vocational training, supported by PHARE; a significant infusion of information and communications technology into basic and secondary schools along with related in-service teacher training; and initiation of structural changes in tertiary education (for example, the creation of private colleges and universities and of new departments in existing public universities).

26. The primary focus of change, however, has been the basic formal education system. This is required but insufficient to ensure that citizens can fully participate in the knowledge economy. Efforts have been made to change pedagogical methods in schools from rote learning to problem solving and teamwork, with the assistance of bilateral and multilateral funds. A major achievement has been the development of secondary school leaving examinations (Matura) and the elimination of the university entrance exam.

27. In addition, the third cycle of the International Mathematics and Science Study (TIMSS) is being implemented. Work is also being initiated on school assessment by grade and subject, and pilot work is being started on defining standards for vocational and professional training (with the assistance of PHARE). But no parallel work has been initiated on standardized assessments of occupational competencies. This is significant progress, but a number of issues emerge surrounding this reform of education, including systematically examining the quality of learning processes and providing a policy framework to support nonformal and informal systems. Quality assurance can be addressed by institutions participating in formal quality assurance programs such as ISO 9000.

Key competencies in basic and secondary education

28. In some quarters there is concern that the Matura exams focus curriculums and teaching on narrow factual learning at the expense of softer and broader competencies. The results of the Citizenship and TIMSS studies indicate shortfalls in selected skill areas (tables A2.4 and A2.5). To ensure that a broad view of competencies is maintained during curriculum reform, Lithuanian educators may want to make use of extensive research just completed on key competencies by the OECD Defining and Selecting Key Competencies project. Three broad areas of competence were identified (Rychen and Salganik 2002), and the research found that countries are at different levels on different competencies:

- *Capacity to act autonomously and reflectively* (having an orientation to the future, awareness of the environment, understanding how one fits, building a sense of self, participation in a social field).
- *Capacity to use tools effectively and interactively* (basic skills, instruments for dialogue, awareness of new tools, accommodation to potential of new tools, use of

information and communications technology, effective use of information and language).

- *Capacity to join and function in socially heterogeneous groups* (social embeddedness of individuals, creating social capital, living in pluralistic societies, managing and responding to others, resolving conflict, participation in groups).

Table A2.4: Citizenship and Education in Selected Countries

| Country | Civic Knowledge | | | Civic Engagement | | Civic Attitudes | |
|---------------|-----------------|--------------------------|--|----------------------------------|-------------------------------------|--------------------------------------|--|
| | Total | Conventional Citizenship | Expected Participation in Political Activities | Trust in Government Institutions | Positive Attitudes about Immigrants | Support for Women's Political Rights | |
| Australia | M | - | - | + | M | + | |
| Belgium(Fr) | - | - | - | M | M | M | |
| Chile | - | + | + | + | + | - | |
| Czech | + | - | - | + | + | + | |
| England | M | - | - | M | - | + | |
| Estonia | - | - | M | - | - | - | |
| Finland | + | - | - | M | M | + | |
| Greece | + | + | M | + | + | M | |
| Lithuania | - | + | - | - | - | - | |
| Poland | + | + | + | M | + | M | |
| Russia | M | - | M | - | M | - | |
| Slovak | + | + | - | + | - | - | |
| United States | + | + | + | + | + | + | |

Source: Citizenship and Education in Twenty-Eight Countries, IEA, 2110

M = Mean, - significantly lower than mean, + significantly higher than mean score

Table A2.5: Percentage of Students Reaching Median in Math and Science

| Country | Science Scores | | | cores | | |
|---------------|----------------|------|------------|-------|------|------------|
| | 1995 | 1999 | Difference | 1995 | 1999 | Difference |
| Hungary | 75 | 79 | 4 | 73 | 74 | 1 |
| Belgium (Fl) | 76 | 76 | 0 | 83 | 85 | 2 |
| Australia | 69 | 74 | 6 | 70 | 73 | 3 |
| Czech | 81 | 74 | -7 | 81 | 69 | -11 |
| Slovak | 72 | 74 | 2 | 77 | 78 | 1 |
| England | 70 | 72 | 2 | 59 | 58 | -1 |
| Russia | 66 | 68 | 1 | 72 | 72 | 0 |
| United States | 64 | 62 | -1 | 59 | 61 | 2 |
| Lithuania | 38 | 51 | 13 | 48 | 52 | 4 |
| Romania | 46 | 45 | -1 | 51 | 49 | -2 |

Source : TIMSS 1999 International Report, IEA.

29. A parallel and supporting conceptual framework indicates that there is recognition of the need to develop competencies for and at different life stages, that competencies fit different life roles, and that lifelong learning is of critical importance (Kegan 1994). Kegan has conceptualized five orders of development and consciousness including, from simple to complex:

- Simple social perceptions and impulses.
- Point of view (role concept and simple reciprocity).
- Traditionalism (role consciousness and mutual reciprocity).
- Modernism (relationship regulating and multiple role consciousness).
- Post-modernism.

30. Related research indicates that almost two-thirds of adults in some industrial countries operate at less than the modernism level, which is required for full functioning in a modern knowledge economy (Tobert 1987).

Secondary vocational education

31. Vocational education is provided at the secondary level in four programs. Stage 1 provides three-year professional qualifications for youth without lower secondary education. Stage 2 provides two-year professional qualifications for youth with a lower secondary certificate. Stage 3 provides three-year professional qualifications and a general secondary education leading to a Matura certificate. Stage 4 provides one or two professional qualifications for those who have completed secondary school (Ministry of Education and Science and Ministry of Social Security and Labor, White Paper on Vocational Education and Training 1999). Table A2.6 summarizes enrollment in these schools, along with overall upper secondary school enrollment (including general education).

32. Most of the approximately 100,000 upper secondary students are in general, not vocational schools. The number enrolled in stage 2 vocational schools is decreasing, while the number in stage 3 is increasing. This is a positive trend, as stage 3 provides graduates with a secondary school leaving certificate (Matura) that helps ready them for lifelong learning. A more worrisome issue is the level of specialization in secondary vocational schools, which currently prepare youth for 1 of about 100 specialized occupations (down from more than 300 in earlier years). This level of specialization does not prepare youth well for lifelong learning or provide them with flexibility in later years in the labor market. Such specialized programs are being phased out of secondary education in most upper-income countries, and being replaced by more general vocational programs that provide skills common to a family of related occupations (mechanical, marketing, information and communications technology) and prepare students for initial job entry or further specialized education at the postsecondary level.

33. To ensure a broad view of competencies, Lithuanian educators may want to use the results of OECD research in curriculum reform, particularly in basic education. The 100 specialized programs in stage 3 and 4 vocational secondary schools should be reduced to 15-20 broader career orientation programs that provide youth with a combination of entry-level job skills, an education that allows a transition to specialized postsecondary training, and preparation for lifelong learning in a changing labor market.

Table A2.6: Students in Vocational and Total Upper Secondary School, 1996-2001

| | 1996 | 1998 | 1999 | 2000 | 2001 |
|---------------------------------|--------|--------|--------|-------|--------|
| Stage 1 Voc. | 6598 | 6927 | 7999 | 7525 | 7704 |
| Stage 2 Voc. | 18574 | 15371 | 11440 | 7456 | 4333 |
| Stage 3 Voc. | 22100 | 26742 | 31918 | 31430 | 28248 |
| Stage 4 Voc. | 4379 | 4630 | 5085 | 5551 | 6720 |
| Total upper secondary education | 122941 | 126079 | 133546 | 98235 | 100957 |

Source: Ministry of Education, Lithuania.

Benchmarking and assessment of key competencies

34. Lithuania has been directly involved in the 1999 Third International Mathematics and Science Study (TIMSS) of grade eight students and the International Association for Evaluation of Educational Achievement (IEA) Citizenship and Education Study (CES). However, it has not been involved in the Program of International Student Assessment (PISA) and International Adult Literacy Study (IALS) or the new Adult Literacy and Life skills (ALL). These studies could provide additional benchmarking on the previously mentioned competencies, and supplement internal assessments. The OECD Defining and Selecting Key Competencies initiative intends to use these assessments in its work.

35. Lithuania should participate in additional international achievement assessments, specifically the PISA and ALL surveys, to benchmark youth and adult education and determine to what degree Lithuanian youth and adults have the necessary core competencies to function in the knowledge economy.

Labor market demand

36. Broad sector employment data is available in Lithuania (see table A2.1). But information on emerging or declining sectors, and on the demand for specific skills, are fragmented and often based on single surveys, picked up from tangential studies, or based on data with limited penetration (such as labor exchange data). There is evidence from some employer surveys that technical and managerial shortages are constraints to development, and is of greater concern the larger the company gets.

37. Labor market monitoring should be expanded in two key areas: implementation of regular short-term, qualitative economic and enterprise surveys like those done in Hungary and Sweden; and development of long-term scenarios of human resource requirements in selected sectors based on national priorities in innovation and research.

38. Another method of determining labor market demand is regular sample follow-up of graduates of both formal and nonformal education and training programs. Formal education institutions do not appear to be doing this on a regular basis. Informal training at labor market

training centers is evaluated, but only on a gross impact basis. This does not provide the necessary evaluation, and quasi-experimental design studies should be done every few years to determine if the programs have a net impact—and if so, which clients receive the greatest benefit (Fretwell, Benus, and O’Leary 1999).

39. All formal and nonformal education and training institutions (secondary schools, colleges, universities, labor training centers) should be required by their public funding agencies to implement annual sample follow-up surveys of graduates to evaluate program impact and linkages with the labor market.

Occupational standards and assessment

40. Occupational standards are essential to ensure that training matches enterprise needs and to facilitate assessments of nonformal and informal training. Although initial work has begun, with support from PHARE, there are questions about whether the standards define occupational competencies (what people do in occupations) or only training standards (curriculum learning objectives); if the methodology for defining standards is sufficiently well defined; if the standards are enterprise driven or educator driven; and if the effort is sustainable. Progress is slow (only 36 standards have been developed, and 50 are planned in the next phase). Government Resolution 624 also defines regulations for assessment and regulation of selected professional qualifications. However, there is a potential need for 300-500 standards, and no work is under way to develop a systematic and standardized approach to assessing skills and knowledge across the occupational spectrum.

41. One of the main challenges in promoting lifelong learning for the knowledge economy is recognition of nonformal learning. This is particularly true in developing countries and is linked to the concept of key competencies, assessment, and increased flexibility in the lifelong learning system. The main arguments for recognition of nonformal and informal learning are that it motivates individual learners, facilitates recognition of alternative learning methods, promotes lifelong learning in general, and facilitates individual mobility. Lithuania needs to examine ways of formally assessing and recognizing nonformal learning; there are two basic approaches:

- *Key competency standards and assessment systems.* The existence of such systems or “common languages” is a prerequisite for embarking on a program to recognize nonformal and informal learning, as this sets up a universally recognized set of indicators against which all learning can be evaluated.
- *Recognizing nonformal learning in the context of formal learning.* An alternative approach to evaluating learning based on key competencies is to recognize nonformal and informal learning within the context of formal learning (for example, by having an individual demonstrate that his or her informal learning is equal to formal learning; then he or she can be issued a certificate from a formal learning institution). The problem with this approach is that it is often not enterprise driven but rather leaves traditional “supply side” institutions—which may or may not reflect the needs of the knowledge economy—in charge of certification.

42. Some formal institutions, particularly in higher education, may have difficulty accepting that an individual can learn without engaging in academic life. These institutions, and related ministries of education, may also see nonformal learning approaches as undermining their business and authority. Similarly, enterprises may resist efforts to regulate and recognize their internal training.

43. Work on defining occupational standards, assessments, and training standards should be accelerated to improve links between training and the labor market, and between formal and nonformal training. Standards development should include high-priority occupations across the full spectrum (that is, those requiring vocational, technical, and professional training), and priorities for development should be established with the business and research communities.

New pedagogy and e-learning

44. Lithuania is aware of the need for new pedagogy and e-learning and is taking steps to address them in the formal education sector and in community settings. This is exemplified by the major effort that has been made to provide information and communications technology to all basic schools: by October 2002, 70 percent of these schools had dial up access and 10 were online. A number of approaches are cited for moving to individual-centered learning, including using different methods of instruction, including use of information and communications technology and e-learning techniques; spending more time on experiential and group learning and on recurrent (not one-time) learning; merging education and training, with an emphasis on a diversity of perspectives; making changes in assessments from measuring knowledge to evaluating performance; and increasing interdisciplinary work (McGinn 1999; ILO 2002).

45. The need to include information and communications technology skills in curriculums is generally accepted. But, there is less agreement on the role of information and communications technology in new pedagogical processes and the actual teaching and learning process. However, the advantages of information and communications technology in supporting changes in pedagogy and improvements in student learning do not come merely from the purchase and introduction of computers in the classroom. OECD (2002) concludes that the effect of information and communications technology on learning has at least as much to do with factors independent of the technology as it has to do with the technology. A policy for information and communications technology in education should foremost be an education policy. The introduction of information and communications technology must therefore be supported by, and supportive of, complementary reforms of the education system.

46. Many developing countries are looking at information and communications technology and e-learning as key ways to promote learning for the knowledge economy. But to date there is little scientific proof of what computers can accomplish in the classroom. Before investing large amounts of scarce resources in information and communications technology, countries should examine the costs, the net impact on learning, the availability of supportive learning policies (such as flexible assessment and credit arrangements), and the infrastructure (such as Internet access in remote and poor communities)—which may in the end primarily benefit already favored groups of citizens. A more detailed discussion on the use of information and communications technology in education can be found in World Bank (2002).

Governance and Management Challenges

Involving stakeholders

47. Meetings with representatives of civil society, labor and enterprises, government, and academics in Lithuania indicate that the Government is acting as a “convener” and that key stakeholders are consulted on policy issues—though some complain consultations occur somewhat after the fact. Tripartite organizations at the national and local levels provide input into labor and vocational and professional education training issues, including the National Employment Council and the Board of Experts of the Lithuanian Labor Market Training Authority. At the local level it is sometimes too difficult to secure representation from all partners.

48. However, higher education institutions have a great degree of autonomy, perhaps to the extent that priorities in some areas (such as research) may address local professional priorities and not national priorities. This problem is exacerbated by the fact that the managers of these institutions are essentially elected by the members of these institutions. The business sector is not sufficiently involved in government and institutional policymaking.

49. Businesses should play a stronger governance role in tertiary education, including serving on boards of governors with policy authority in selected areas (including the hiring of management staff), and be more involved in government education policy development and institutional program development (defining curriculums, operating joint programs including internships, cooperative education, and research programs).

Decentralization

50. In both the industrial and the developing world, a transfer of responsibilities from central ministries of education to local education authorities, communities, postsecondary institutions, and schools has become common. There are indications that decentralization and school autonomy increase enrollments, education coverage, and local capacity. By making government more accessible and accountable to people through increased participation, easier access to information, and greater communication, democratization and political stability are also enhanced. But decentralization needs to occur within a regulatory framework that ensures minimum standards of quality and content are maintained to help ensure equity, labor force mobility, and adequate financing.

Openness and the international dimension

51. Stronger international linkages, increased mobility, and better access to information have allowed countries that open up to international markets to reap the benefits of the knowledge economy. This has created opportunities to learn from international experiences and to build partnerships across countries, making the cost of not opening up even greater. Openness also invites greater influences from abroad, such as foreign provision of tertiary education and

international education assessments, and can stimulate the development of lifelong learning by increasing competition.

52. Lithuania's Government could make internationally driven innovation a central part of their policies while taking into account the pitfalls of internationalization—such as accelerated brain drain. Examples are increasing where the state fosters innovation by building international partnerships between ministries, between the public and private sectors, between private sector agents, and between universities to incorporate global best practices in education—from sponsoring exchanges of ideas and people to conducting joint R&D (World Bank Institute 2001).

Intellectual property rights

53. Intellectual property rights are discussed in more detail in other parts of this report. But they are of considerable concern in the Lithuanian environment in the context of lifelong learning and the encouragement of the creation of knowledge. It is vital to protect intellectual property rights. While intellectual property rights are sometimes seen as a mainly economic or legal issue, their implications for the learning system should not be overlooked.

54. Human capital and support for technical change and innovation are among the conditions facilitating intellectual property rights. If there are few incentives and opportunities to create, use, and transfer knowledge during learning, the education system will not be well equipped to prepare people for the knowledge economy. Strong intellectual property rights encourage international learning providers to enter developing countries, providing access to global knowledge. But the design and application of intellectual property regimes need to promote the creation and use of knowledge—and recognize the costs and uses of intellectual property rights. This is a particular concern in Lithuania, where intellectual property rights in tertiary education are not well defined. Thus the roles of staff and higher education institutions regarding intellectual property rights need to be clarified to provide incentives for faculty to engage in applied and developmental research.

Accountability and transparency

55. Accountability aims at making the state more responsive to its people by responding effectively and transparently to its needs, ensuring that people's voices are heard. A knowledge economy subjects policymakers and public servants to greater pressure to deliver results. This results-driven approach often leads to a shift from input-oriented to output-oriented management, increasing the accountability of government at all levels. Nevertheless, promoting accountability remains a major challenge for many countries, and ways need to be explored on how the mechanisms of the knowledge economy can be used to enhance accountability—such as through e-government and more participatory approaches.

56. Research indicates that a change from the worst rule of law (0.0) to the best (1.0) would contribute an enormous 3 percent of economic growth per year across all developing countries (Barro 2000). Good governance has a direct correlation with a number of human development indicators, including literacy, per capita income, and life expectancy (Kaufmann, Kraay, and Zoido-Lobaton 1996, 2000; see <http://www.imf.org/>). For example, providing better

information, education and training opportunities, career choices, and resources to learners helps orient learners and inform policymakers of actual needs—while also strengthening the dialogue between institutions and individuals. At the same time, greater accountability and transparency ensure a greater focus on equity, with the potential of reducing social and economic inequalities.

Financing

57. Given the rising demand for learning, and rising expenditures, several principles should guide future education financing:

- The acquisition of basic competencies, which increasingly means universal upper secondary education, should be financed from public funds.
- Learning beyond the basic competencies should increasingly be the responsibility of learners and employers.
- The Government should promote equity.
- The system should promote efficiency in delivery and delivery for the labor market.

Some of the available financing options are summarized in table A2.7.

Table A2.7: Options for Financing Lifelong Learning

| Who Ultimately Pays | Who Finances | Collection | Financing Mechanism | Instrument |
|-----------------------|--------------|------------|---------------------|--------------------------------------|
| Student | Student | N/A | N/A | Education Savings Account |
| | Private | Private | Fixed | Private Loan |
| | | | Combined | Private Income Contingent Loan |
| | | | Variable | Human Capital Contract |
| | | Public | Fixed | |
| | | | Combined | Institutional Income-Contingent Loan |
| | | | Variable | Institutional Human Capital Contract |
| | Public | Private | Fixed | Private Collected Public Loan |
| | | | Combined | |
| | | | Variable | |
| | | Public | Fixed | Public Loan |
| | | | Combined | Public Income-Contingent Loan |
| | | | Variable | Graduate Tax |
| | | Community | Variable | Individual Development Account |
| Employer | Private | N/A | Variable | On-the-job training |
| | Public | Public | Variable | Training Levy/Payroll Tax |
| Government (taxpayer) | N/A | N/A | N/A | Direct Funding |
| | | | N/A | Vouchers and entitlements |
| | | | N/A | Grants |
| | | | N/A | Interest subsidy on loans |
| | | | N/A | Tax Credit |

Source: World Bank 2002, p. 63.

58. State financing of formal education and training in Lithuania is comparable to that in similar countries (see Table 2.3). The new decentralized approach to financing basic education is on a per capita basis, is sensitive to rural-urban differences, and makes provisions for special allocations (such as in-service teacher training, which is minimal but important to continue). However, several financing issues need to be addressed, particularly given rising demand, to increase efficiency, access, and equity of tertiary as well as of nonformal adult and continuing education.

59. *Efficiency.* One-way to free up revenue for new purposes is to become more efficient in the use of existing revenue. The first place to look is student-teacher ratios, since staff costs represent the largest portion of education budgets. Student-teacher ratios in Lithuania, at least in basic education, are slightly lower than the international average (in the range of 11:1).

60. School mapping should be undertaken in primary, secondary, and higher education to examine the impact of the 40 percent decline in Lithuania's birth rate in the 1990s—which is starting to affect primary schools and will impact tertiary education in about 2009, and will require institutional consolidation in tertiary education. Other areas to consider include better construction, as Lithuania spends about twice as much on utilities as Western schools in similar climates.

61. *Tertiary education.* Tertiary education is a critical element of lifelong learning. Although tertiary education provides skills beyond basic competencies, continued government support for it is justified because tertiary education provides major benefits for economic and social development and helps sustain basic education (Ministry of Education and Science, Higher Education in Lithuania White Paper 1999). There are two types of tertiary education institutions in Lithuania: universities and colleges. In 2001 there were 35 such institutions, including 22 state (15 universities and 7 colleges) and 13 nonstate (4 universities and 9 colleges; Ministry of Education and Science 2002).

62. The gross enrollment rate in tertiary education was about 41 percent in the mid-1990s but climbed to about 80 percent in 2001 (three-quarters in universities and one-quarter in colleges). That overall rate is similar to the 81 percent in the United States and above the 57 percent in Western Europe and 60 percent in the G-7. But questions have been raised about the mix of enrollments between universities and colleges, as there is a growing need for college-educated technicians. Several other issues emerge from an analysis of the financing of tertiary education (Sheehan 2002). The following policy options should be considered:

- *Mobilizing more resources per student.* University resources are relatively low, at just over 4,000 litas (\$1,150) per student. Given the high intake rate (nearly 60 percent of the university-age cohort), there are strong arguments for increasing student financing for higher education, because the Government will soon have to choose between increasing per student financing while maintaining the overall budget allocation to the sector, or keeping student financing constant while reducing the overall budget allocation. Four options should be examined. First, tertiary tuition fees could be increased in real terms to, say, 2,000 litas per student per year and made universal, to mitigate the effects of the loss of fee revenue that will occur if recent policy changes are fully implemented. Second, a grant scheme to cover students' subsistence costs (similar to the present one) could be retained, with social criteria determining eligibility. This should be integrated with the scheme for fee rebates. Third, loan funds should be targeted more to high-ability students rather than poor students. That approach should reduce risks for lenders and increase recovery rates, providing more funds for future lending. Loans would still be effectively subsidized, at least for bachelor's-level students. Fourth, a more radical move might be to concentrate student grants of all forms (fee rebates, grants for living expenses, and so on) on level 1 (bachelor's) programs and to make loan finance the main instrument at the master's level, with a much greater emphasis on cost recovery than at present—on the grounds that master's-level students are closer to commencing employment and less likely to be at risk of failure or dropout. More resources are a necessary but

insufficient condition for quality. They in no way lessen the need for quality assurance procedures.

- *Enhancing professional expertise in tertiary education management.* Managing higher education systems requires a significant skill base. For example, devising a suitable formula for allocating grants to higher education institutions based on unit costs requires an understanding of education and cost accounting principles in the ministries of finance and education, the Council of Rectors, and the institutions themselves. Some of these may be underresourced. Although this report has not investigated this issue in depth, the case for any increase in resources for the higher education system will be stronger if management capabilities within the system are considered adequate.
- *Replacing and retaining academic staff.* Approximately 55 percent of university academic staff are over 50, which implies a very high replacement requirement between 2002 and 2017. The number of doctoral degrees being awarded (on average slightly over 200 per year) is well below the number required to meet replacement needs. There is also an acute problem of retaining high-quality staff, because university salaries are low. Salaries are determined by government and civil procedures, and universities have limited scope to supplement salaries with research grants and the like. One way of increasing flexibility would be to move academics (on a voluntary basis) to nine-month employment contracts while paying them the same annual salary. Replacing all the staff due to retire with staff concentrated in a 15-year age group (say, ages 25 to 40) would perpetuate imbalances in the age-structure. It might also lead to an excess supply of permanent staff in the years following 2009 (when the demographic downturn kicks in). Greater use of contract staff and selective re-employment of staff age 65-70 on annual contracts could help alleviate potential adjustment problems.
- *Increasing the financial power of higher education institutions.* In general, the buildings used by state universities and colleges are state property and are not owned by the institutions themselves. Institutions are in the position of having to maintain property they do not own and are unable to change their property portfolios through sales and acquisitions. In addition, some institutions want to carry out major refurbishments to buildings but do not have sufficient financing to do so—and cannot borrow because the buildings are not theirs to pledge as security. A transfer of state property to higher education institutions could unlock some funding through the banking system, as well as allow for greater flexibility in property use and management.

63. *Nonformal adult and continuing education and training.* There is a void in government financing for nonformal adult and continuing education and training, except for limited resources for training for the unemployed. Given the changing economy, increasing demand for skilled over semi-skilled workers, and high unemployment among low-skill workers, financing for this aspect of lifelong learning should not be overlooked. There is growing empirical evidence that the inability of low- and semi-skilled workers to stay in the labor force is directly linked to their skill levels (OECD 2001 a).

64. One could argue that direct state financing is inappropriate given that the returns to such education and training accrue to individuals and the private sector—and thus that these beneficiaries, not the state, should pay. On the other hand, investment in adult continuing education and training is good for the nation and the economy, so some public support, direct or indirect, may be appropriate. The latter argument prevails in many countries. A number of individual-based schemes are available, including cost recovery (loans, graduate taxes) and subsidies (learning accounts, vouchers; see table A2.7). Other approaches include tax credits and payroll taxes. Payroll taxes for training have been used successfully in Brazil, France, and Malaysia, and can be partly or fully forgiven if employers provide recognized training to employees. Such taxes have the disadvantage of increasing wage costs, but in discussions Lithuanian employers did not voice resistance to the concept.

65. Alternative financing schemes (tax incentives, training levies, learning accounts, and so on) should be examined and implemented to encourage enterprises to support and individuals to engage in adult and continuing education. In addition, any potential financial disincentives (such as taxes on training investments by individuals and enterprises) should be eliminated.

Opening Pathways within and between Learning Systems

66. Serious blockages in Lithuania's education and training systems inhibit vertical and horizontal movements of learners within the formal learning system and between the formal and nonformal systems, block economic and social mobility, and impede interdisciplinary learning. Agreements are needed to promote alternative pathways within and between different types and levels of institutions.

Blockages between formal education institutions

67. There are blockages in Lithuania between colleges and other higher education institutions. There are no standard procedures for transferring credits between parallel institutions or from lower- to upper-level institutions. Students at lower-level education institutions are at the mercy of upper-level institutions, and a lack of transparent third-party assessments complicates the issue. When credits are transferred, evaluations are based more on inputs (hours completed and courses taken) than outputs (competencies demonstrated). Examples of blockages include the fact that in some cases students at institutions (such as colleges) can transfer credits more easily—under EU Barcelona Agreements—to institutions outside, rather than inside, Lithuania. It is sometimes even difficult to transfer credits between parts of the same higher education institution.

68. There is a need for a third party to act as an honest broker and assessment agent for learners to define equivalencies between programs and courses in different institutions, and to facilitate the mobility of learners within and between institutions in the formal education system (box A2.1).

Box A2.1 Korea's Credit Bank System—promoting lifelong learning opportunities

Korea's Credit Bank System provides citizens with a variety of education opportunities. The system, established in 1995, helps achieve lifelong learning by diversifying and maximizing education opportunities for both youth and adults. The system recognizes diverse learning experiences gained both in and out of school. When learners accumulate the necessary credits, they can be awarded a degree from the Credit Bank that accredits a variety of education programs—guaranteeing open, flexible access to high-quality continuing education.

Source: See <http://www.unescobkk.org/education/appeal/clc/pdf/effective/KOREA.pdf>

Blockages between formal and nonformal learning

69. Blockages between formal and nonformal (and informal) learning are similar but even more pronounced than those in the formal education system because nonformal learning often provides no academic credit equivalent. Thus the only way to move forward is to assess competencies. But there is no nationally recognized system for occupational standards and assessments, which blocks the granting of credits based on assessments of competencies. Moreover, individual institutions are often unwilling to perform assessments for individual citizens.

70. There is a need to continue rapid development of occupational standards and assessment instruments, to promote recognition of nonformal and informal learning, and to facilitate recognition of nonformal and informal learning in formal education institutions (box A2.2).

Box A2.2 Recognizing nonformal, informal, and nontraditional learning—approaches around the world

Many traditional education institutions in *North America* have considerable flexibility in granting academic credit for learning achieved in nontraditional ways. In contrast, *Europe* has no unified approach (CEDEFOP, 2002), although a European Skill Card has been proposed that could help lead in that direction. In *Austria* and *Germany* only 5 percent of training examinations evaluate nonformal training, and the results are calibrated in the context of the formal system. In the Mediterranean region, which has a weaker tradition of formal training, recognition of nonformal training is more important. *Italy* recently introduced a skills audit system, and *Portugal* and *Spain* are working on similar initiatives. In *Greece* such recognition is held back by a lack of defined occupational standards. In Nordic countries, particularly *Finland* and *Norway*, recognition of nonformal training has moved to the fore of public debates on education training policy, and national systems are being developed. France has an assessment system called the Bilan de Competence.

Equity and Access

71. Lithuania needs to address disincentives—and a lack of incentives—for individuals and enterprises to invest in education and training. (Several of these issues have already been discussed in previous sections.)

Career guidance and counseling

72. The need to enhance career guidance and counseling services is recognized in a 2002 review completed by Lithuania in cooperation with the EU European Training Foundation. Some such initiatives are under way at labor offices and in higher education institutions. The review, however, indicates that more work is needed. If youth and adults are to be motivated and increasingly take responsibility for managing their learning, it is essential that they have information about themselves and about the society and economy in which they must function.

73. Career guidance and counseling policies and services are essential to this process. These services focus on two aspects of learning. First, they help individuals understand their aptitudes and interests. Second, they provide individuals with information on the labor market to facilitate career planning. Policies for career information, guidance, and counseling services can support both social and economic development objectives, and provide key support to facilitate and promote lifelong learning.

74. Career **guidance and counseling** promote social equality and inclusion and access to education and employment opportunities. Such guidance can perform a valuable role in raising the aspirations of disadvantaged and poor individuals by making them aware of opportunities and supporting them in securing entry to such opportunities. These services promote individual liberty and emphasize the “active individual”—affirming the value attached in democratic societies to people’s rights to make free choices about their lives.

75. These services also support economic efficiency, as they are a means of making the labor market operate more effectively. Attempting to deal with economic efficiency and social equality through structural reforms alone is not enough. In a sense, career guidance can be viewed as a kind of brokerage between individual and social needs. It addresses both individual rights and responsibilities in a social context. It is a means of encouraging individuals to participate in determining their role in—and contribution to—the society of which they are a part. In this sense career guidance is a vital tool of civil society.

76. Lithuania needs to address a number of questions in this regard, including:

- What is the setting and starting point for career development policy? This is affected by geopolitical, economic, cultural, and leadership issues.
- Who are the key stakeholders, how will they be involved in governance, and what approaches will be taken to finance the development and delivery of services?
- Will policies reflect preventative, reactive, or remedial approaches?

- How will policies address and affect access by different target groups?
- Do policies need to be adjusted in decentralized relative to centralized settings?
- How will standards and staff training be developed and maintained?
- What type of evaluation and research should be undertaken to determine the impact of these policies and services and to refine them? There is some evidence on the net impact of career guidance services (Fretwell, Benus, and O’Leary 1999), and this topic is of critical importance in developing countries—which have constrained resources and multiple priorities.

77. Career services need to be developed further, particularly at the basic and secondary school levels and in labor offices. There is a need to develop training programs at higher education institutions to prepare career guidance and counseling staff for education, training, and employment institutions, and for work in the personnel departments of private enterprises.

Motivating enterprises and workers to invest in training

78. Surveys in the region and in Lithuania indicate that workers are not very interested in upgrading their skills (65 percent said they did not need training in a recent Lithuanian survey). And while some large information and communications technology enterprises and those involved with multinational corporations indicate an interest in providing or financing training (or both), the general situation is not good—for example, one recent survey of some 300 employers found that only 7-8 percent were interested in providing or financing training. A recent management survey found that only 30 of 300 private enterprises budgeted for employee training.

79. Other than a lack of appreciation of the importance of employee training, enterprise representatives cited the poor quality of training in some formal institutions and the lack of tax incentives. In addition, there may be negative tax incentives for employees who receive training, as they have to report training financing as income and pay taxes on it.

80. These issues call for government review, including consideration of payroll training taxes, tax credits, and other mechanisms to promote enterprise training. Employer efforts mainly involves occupational training. But employer-based literacy foundations, and civics programs exist in some countries, such as Brazil. Worldwide, employer involvement in adult continuing education is difficult to quantify. Information tends to be better when payroll training taxes are in place, but there is a considerable body of other research on employer-based adult continuing education. Many workers receive some training from their employers with or without training taxes. Employers tend to invest most extensively in training their best-educated and best-trained employees, while low-income employees are more poorly educated and receive little training from employers (OECD and Human Resources Canada 1997).

81. Employers tend to invest in younger but experienced workers, and more training occurs in growing sectors. Small firms invest less in training than larger firms, and trained workers are less likely to be laid off or to quit their jobs. In some countries employers are outsourcing training in the same way they outsource other services, so they do not have to maintain internal training departments and staff. This is increasing the demand for training provided by public and private training agencies, and it is not unusual—from Hungary to the United States—to find public, quasi-public, and private training agencies that provide contracted, customized education and training services to enterprises.

Related issues

82. *Financing is key to motivation.* This issue has been addressed in previous sections. At the basic school level, the financing basket should take into account the additional needs of rural schools. At the higher education level, the possibilities of built-in inequities in the new student financing scheme and student loan scheme have already been noted.

83. *Access to Internet services.* There is concern about social and economic exclusion in rural and depressed areas, particularly with regard to Internet access, and initiatives are under way to overcome lack of connectivity (including telecommunications reform and private initiatives to provide rural communities with Internet access). Actions have been taken within the education sector and by civil society organizations, with considerable participation by the private sector.

84. *Supply of education and training services.* The opening of private basic schools, colleges, and universities has expanded access—but not necessarily increased equity at the tertiary level because of the high costs involved. The design of financing schemes for low-income families will be critical to ensure that supply and demand can meet on equitable ground.

85. *Services for the disabled.* Information and communications technology and the knowledge economy provide opportunities for the disabled and handicapped to become involved in social and economic life. While some initiatives are under way (such as special Ministry of Education funding for adults), additional activities and improvements are needed. For example, one training program for the disabled in Kaunas was on the second floor of a building, requiring participants to be carried up the stairs. Many public education facilities have limited access for the disabled.

86. *Motivation of staff in education and training institutions.* The low salaries of education staff at the higher education level are a growing problem for the recruitment and retention of young staff and threaten the quality of teaching as existing staff tend to have multiple jobs and may put minimal effort into their primary job at a university or college. The emergence of private institutions, which can pay market rates, will tend to draw good staff away—while state institutions are restricted by state salary rules. Staff remuneration policies need examination.

Research and Knowledge Generation

87. The linkages between basic and applied research and the learning process are critical to the development of the knowledge economy. This issue is of particular importance at the upper levels of the higher education system, including both public and private universities and colleges. This issue is addressed in more detail in the main report, but several issues need to be addressed:

Priorities

88. There is a need to focus limited state resources on high-priority areas for the development of the knowledge economy in Lithuania. Institutional and academic autonomy is laudable, but Lithuania is a small country with limited resources—and should focus these resources on topics with high rates of return.

Linkages

89. There is a need to build mechanisms that facilitate cooperative agreements between different parts of the learning system and research institutions—something that was not always encouraged in socialist times—and between the private sector and tertiary education. One impediment to the latter is the rigid time requirement for undergraduate and graduate degrees, which does not facilitate the development of formal cooperation and internships between university students and enterprises, which can be key to developing research linkages.

Competition

90. The simple allocation of state funds to research institutes and higher education institutions based on formulas and without formal competitive processes does not facilitate research that is responsive to priorities or of the best quality. More competitive forces should be introduced in the financing of research in higher education.

Annex 3: Lithuania's Innovation System: Connecting Researchers and Businesses

Introduction

1. Innovation has a significant effect on productivity at the level of the firm, the industry, and the country and is thus a key factor in economic growth. Lithuania's ability to systematically generate, acquire, diffuse, and apply knowledge in new ways to solve problems and satisfy the needs of individuals and of society at large—that is, to innovate—is constrained, however. Innovation can take place through technical change, such as product and service development, and through process and organizational change, such as organizational, managerial, and marketing innovations and process renewal.

2. The major stakeholders in an innovation system include universities and research institutions, private enterprises (including foreign enterprises) and their organizations, venture capitalists and other providers of funds, and government and associated agencies. They also include partners in research, business, and finance abroad. An innovation system depends on establishing the proper division of functions and processes between government, the research community, and the private sector. Lithuania offers important elements of an innovation system, including universities, state research institutions, a business community, and a set of institutions aiming to support technology applications. But so far Lithuania has not managed to bring the various elements of its innovation infrastructure to interact effectively and systematically within a coherent and coordinated framework able to link the research and development (R&D) community with the enterprise community. It is thus forgoing considerable potential to translate knowledge into commercial activities that generate wealth.

3. Innovation occurs at the enterprise level in Lithuania, including in some high-tech industries (laser technology, biotechnology), but it has taken place in a relatively few, isolated cases. The few success stories reflect Lithuania's potential for innovation rather than a systematic use of the country's knowledge assets. Some changes have been introduced in the national innovation system in recent years, driven in part by the consensus building effort associated with the issuance of the Lithuanian Science and Technology White Paper. Yet much more needs to be done in defining a coherent innovation policy and in establishing policy instruments and a supportive institutional framework that allows potential partners in innovation to join efforts in generating and applying knowledge for their own benefit and that of the economy.

4. In the early years of independence Lithuania was left with a legacy of a centralized and closed science system that provided substantial funding in narrowly specialized fields, and a research community largely isolated from the rest of the world. Much former enterprise-level R&D capacity was lost in the course of privatization. Despite considerable progress in recent years in restructuring and modernizing the national innovation system, which has helped retain significant talent and research capacity in Lithuania, many of the current organizational structures tend to follow and even reinforce the old practices of separating rather than unifying the basic partners for innovation. Compared with R&D systems in Western European countries,

the Lithuanian system is inflexible in the sense that nearly all public resources are fixed with existing institutes. This kind of system is naturally inclined to resist any changes in priorities, division of resources, and ways of working. Cooperation and interaction of companies with research institutes and universities is modest and occasional. The same is true of cooperation and interaction between research institutes and universities and among research institutes, as well as in programs where companies, universities, and research institutes join their resources and competencies.

5. Many analytical reports have been written by national and foreign experts on science, technology, and innovation in Lithuania and the need to strengthen these basic elements of a knowledge-based economy. The reports and their recommendations led to the Lithuanian Science and Technology White Paper and associated action plans, which have received positive and almost unanimous support among politicians, civil servants, and members of the research establishment and business community. But only a few of the recommendations have been implemented, and these only partly. This annex highlights key issues and policy proposals for implementation. Unless policymakers take the lead in addressing the issues, Lithuania risks further forgoing its potential for innovation and increased competitiveness as well as missing out on the important opportunities for innovation arising from membership in the EU.

No time to lose

6. While the importance of an effective innovation system is gradually coming to the forefront of policy thinking in Lithuania, member countries of the European Union (including candidate countries such as Estonia and Hungary) and the OECD have been undertaking wide-ranging reforms across a broad spectrum of innovation policies to gear up and improve competitiveness.

Opportunities

7. Lithuania is gearing up for the European Research Area, but there is a real likelihood that the current innovation system will be unable to make good use of networking opportunities and resources available.

Challenges

8. Lithuania's low ranking on the World Economic Forum's Technology Subindex (41st out of 75 countries) is also reflected in the European Innovation Scorecard 2002 developed by the European Commission to benchmark strength and weaknesses of national innovation performances at the aggregate level (table A3.1).

Table A3.1: European Innovation Scoreboard 2002 – Candidate Countries

| Indicator | EU | CC ₁ Mean | BG | CY | CZ | EE | HU | LT | LV | MT | PL | RO | SI | SK | TR |
|---|-------|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| New S&E grads | 10.26 | 6.60 | 4.73 | -- | 4.00 | 6.83 | 4.49 | 9.35 | 5.52 | 6.12 | 5.90 | -- | 13.10 | -- | 5.47 |
| Population with tertiary education | 21.22 | 17.50 | 21.29 | 26.76 | 11.59 | 29.42 | 13.96 | 45.03 | 18.15 | 7.00 | 11.73 | 9.97 | 14.12 | 10.66 | 8.00 |
| Participation in life-long learning | 8.50 | 5.40 | -- | 3.10 | -- | 5.30 | 3.00 | 3.70 | 16.30 | 9.70 | 5.2 | 1.10 | 3.70 | -- | 3.20 |
| Employment in med/high-tech manufacturing | 7.57 | 5.40 | 5.50 | 1.03 | 9.16 | 4.79 | 8.80 | 3.18 | 1.72 | 7.14 | 7.54 | 4.91 | 8.74 | 6.75 | 1.19 |
| Employment in high-tech services | 3.61 | 2.60 | 2.71 | 1.83 | 3.22 | 3.38 | 3.24 | 2.10 | 2.19 | 3.06 | -- | 1.43 | 2.71 | 3.03 | -- |
| Public R&D/GDP | 0.67 | 0.41 | 0.41 | 0.20 | 0.54 | 0.53 | 0.45 | 0.53 | 0.29 | -- | 0.45 | 0.10 | 0.68 | 0.24 | 0.53 |
| Business R&D/GDP | 1.28 | 0.32 | 0.11 | 0.05 | 0.81 | 0.15 | 0.36 | 0.07 | 0.20 | -- | 0.25 | 0.30 | 0.83 | 0.45 | 0.27 |
| All EPO patents/population | 152.7 | 7.10 | 3.2 | 6.00 | 12.10 | 6.90 | 16.10 | 1.10 | 2.50 | -- | 2.30 | 0.90 | 20.60 | 5.90 | -- |
| EPO high-tech patents/population | 27.80 | -- | -- | -- | -- | -- | 1.51 | -- | -- | -- | -- | -- | -- | -- | 0.06 |
| USPTO high-tech patents/population | 12.40 | 0.50 | 0.12 | -- | 0.58 | -- | 0.30 | 0.54 | -- | 2.60 | 0.05 | 0.04 | 0.50 | 0.19 | 0.02 |
| SMEs innovation in-house | 44.00 | -- | -- | -- | -- | 33.20 | -- | 51.00 | -- | 15.40 | 4.10 | -- | 16.90 | -- | 24.6 |
| SMEs innovation co-op | 11.20 | -- | -- | -- | -- | 13.00 | -- | 12.00 | -- | 4.90 | -- | -- | -- | -- | 18.0 |
| Innovation expenditure | 3.70 | -- | -- | -- | -- | 2.40 | -- | -- | -- | -- | 4.10 | -- | 3.90 | -- | -- |
| High-tech venture capital/GDP | 0.24 | 0.27 | -- | -- | 0.02 | -- | 0.04 | 0.90 | 0.62 | -- | 0.05 | -- | 0.15 | -- | 0.13 |
| New capital | 1.73 | -- | -- | -- | -- | -- | -- | -- | -- | 3.68 | 0.23 | -- | -- | -- | 0.69 |
| New-to-market prod | 6.50 | -- | -- | -- | -- | 6.00 | -- | -- | -- | 37.8 | -- | -- | -- | -- | 9.40 |
| Home internet access/household | 37.70 | -- | -- | -- | -- | 9.80 | 2.60 | 3.00 | 2.00 | -- | 8.00 | -- | 24.00 | -- | -- |
| Home internet access/population | 31.40 | 14.80 | 7.50 | 22.10 | 13.60 | 30.10 | 14.80 | 6.80 | 7.20 | 25.40 | 9.80 | 4.50 | 30.0 | 16.70 | 3.80 |
| ICT expenditures/GDP | 8.00 | 6.0 | 3.80 | -- | 9.50 | 9.60 | 8.90 | 5.90 | 7.90 | 4.10 | 5.90 | 2.20 | 4.70 | 7.50 | 3.60 |
| Manufacturing hi-tech value-added share | 10.10 | -- | 5.90 | -- | -- | -- | 14.85 | 22.35 | -- | 22.44 | -- | -- | -- | -- | 6.55 |
| Inward FDI/GDP | 30.30 | 31.3 | 26.4 | 23.7 | 42.60 | 53.20 | 43.40 | 20.60 | 29.10 | 84.70 | 21.30 | 17.70 | 15.50 | 24.20 | 4.70 |

Source: European Commission. Commission Staff Working Paper SEC(2002) 1349 9.12.2002. See also: www.cordis.lu/trendchart

Data in *italics* are national estimates collected from the Group of Senior Officials in Innovation Policy.

EU: European Union; CC: Candidate Countries; BG: Bulgaria; CY: Cyprus; CZ: Czech Republic; EE:

Estonia; HU: Hungary; LT: Lithuania; LV: Latvia; MT: Malta; PL: Poland; RO: Romania; SI: Slovenia;

SK: Slovak Republic; TR: Turkey

S&E: Science and Engineering; EPO: European Patent Office; USPTO: United States Patent and

Trademark Office; ICT: Information and Communication Technology; FDI: Foreign Direct Investment; "--

": not available

¹ Unweighted average for countries for which data are available. Available data are insufficient for calculating weighted means.

9. The effective functioning of Lithuania's innovation system is constrained by a large disconnect between enterprises and the R&D community, unsatisfactory R&D output (in terms of patents and publications), an overemphasis on public-sector-driven R&D, the aging of the Lithuanian research population and associated brain drain, a large number of R&D-related institutions, and low levels of funding and outdated funding approaches.

Disconnect between enterprises and the R&D community

10. Enterprises, worldwide, are the drivers of innovation. Overall, however, Lithuanian enterprises spend little on R&D. Lithuania's business expenditure on R&D amounts to only 0.07 percent of GDP (or 12 percent of Lithuania's total expenditures on R&D), compared with 1.28

percent of GDP for the European Union and 0.32 percent for EU candidate countries on average in 2000.²

11. Demand for R&D services and innovation seems low, in part, because companies are struggling to survive in the current business environment. Only 4 percent of Lithuania's R&D personnel are employed in the private sector. Nor do enterprises interact much with the national science system. According to a survey carried out by the Department of Statistics in 1999, less than 4 percent of enterprises develop new technologies in cooperation with public research institutions; the vast majority develop new technology in-house (54 percent), with other enterprises (9 percent), or with foreign specialists (23 percent) or acquire it through licenses (10 percent).

12. The prevailing view held by Lithuanian business representatives is that the country's R&D institutions provide little commercially relevant output (which contrasts with their positive assessment of individual researchers, who are often hired by enterprises to apply new technologies). The almost complete disconnect between the research and business communities, compounded by low demand from enterprises for innovation, does not augur well for Lithuania's future innovation performance and competitiveness.

Unsatisfactory R&D output

13. Publications, citations, patents, and licenses are commonly used indicators of R&D output in most OECD and other industrial countries. But only anecdotal information is available on Lithuanian output indicators. The number of articles published in scientific periodicals per researcher in highly developed countries usually comes to 0.5 a year; according to data available for 2000, this indicator in Lithuania was as low as 0.05, which, roughly speaking, implies that in Lithuania the "productivity" of researchers is a tenth of the average in highly developed countries. The Lithuanian patent office received 86 patent applications in 1999 (134 in 1998) from Lithuania and 71 from other countries. In 1999 it granted 93 patents to Lithuanians and 67 to foreigners.

Overemphasis on public-sector-driven R&D

14. Gross domestic expenditure on R&D in Lithuania has been growing continually since 1997³. Total funding for R&D was LTL 224.9 million in 1997, LTL 250.7 million in 1998,

² European Commission, 2002 European Innovation Scorecard.

³ Gross domestic expenditure on R&D is the conventional input measure for R&D. Used in the OECD countries since the late 1960s, the indicator measures investment in R&D, covering public and private expenditures and their financing. Financing can be used for basic and applied research and direct product and process development. Human capital investments can also be estimated by the number of researchers engaged in R&D activities.

The main source of information on R&D inputs in Lithuania is R&D statistics compiled by Statistics Lithuania. The Lithuanian Science and Technology White Paper draws attention to the fact that statistical data on R&D in Lithuania are rather poor. Available statistics on Lithuanian R&D activities are often incompatible from one institution to the next as well as for purposes of international comparison. In principle, in compiling data on R&D statistics, Lithuania applies the OECD Frascati Manual, which has been in use in OECD countries for decades. But in fact

LTL 224.6 million in 1999, and LTL 277.6 million (or around \$70 million) in 2000. This amounts to about \$17 per capita, compared with \$681 in the United States and \$222 in Italy.⁴ Lithuania's gross domestic expenditure on R&D amounted to around 0.6 percent of GDP in 2000 (up slightly from 0.57 percent in 1997). This compares with 2.3 percent of GDP for the OECD, 1.9 percent for the European Union, and 0.7 percent for the EU candidate countries on average. Even if the actual resources devoted to R&D in Lithuania are greater than the official data suggest, the country's R&D expenditure is much lower than the EU or OECD average.

15. In Lithuania the state budget provides the bulk of the funding for R&D, around 88 percent, for research performed almost exclusively by public institutions (universities and state research institutes). By comparison, the share for the OECD is 29 percent, for the EU, 34 percent, and for the EU candidate countries, 56 percent on average.

16. In 2000 a total of 14,592 people were involved in R&D in Lithuania, of which 8,841 (61 percent) were in the higher education sector; 5,077 (35 percent) were in the government sector, mainly in state research institutes; and 674 (4 percent) were in the business enterprise sector. The share of researchers in total R&D personnel was 69 percent, and more than half hold a PhD. Only 44 (0.8 percent) of researchers with a PhD worked in the business enterprise sector.

17. The major part of Lithuanian R&D capacity is concentrated in higher education and other government institutions. In 2002 there were three types of public research institutes in Lithuania:

- *University research institutes*, established to carry out research of high international quality. They focus mainly on basic research and provide the research basis for university education, for doctoral studies, and for improving university personnel's scientific qualifications.
- *State research institutes*, established to carry out long-term research of international quality important for the Lithuanian economy and culture and for international cooperation—research involving groups of specialized scientists and requiring data collection and specialized experimental instruments. State research institutes together with higher education institutions help to train specialists. Guidelines for research by state research are provided by the Ministry of Higher Education and Science.
- *State research establishments*, which aim to carry out applied research and experimental development activities important for the Lithuanian economy and culture and for the development of industry, state government, and other institutions.
- The higher education sector comprises 10 universities, 5 academies, 7 state colleges, 9 nonstate colleges, and 5 state research establishments. Other government

there are still several differences in basic definitions and classifications. Therefore, the data are not necessarily reliable, particularly for international comparisons.

⁴ Lithuanian Science and Technology White Paper (p. 56).

institutions include 26 state research institutes, 18 state research establishments, and 25 other R&D entities. Nearly all research institutions are concentrated in the five largest cities: Vilnius, Kaunas, Klaipeda, Siauliai, and Panevezys. By comparison, only some 60 enterprises in Lithuania carry out R&D activities.

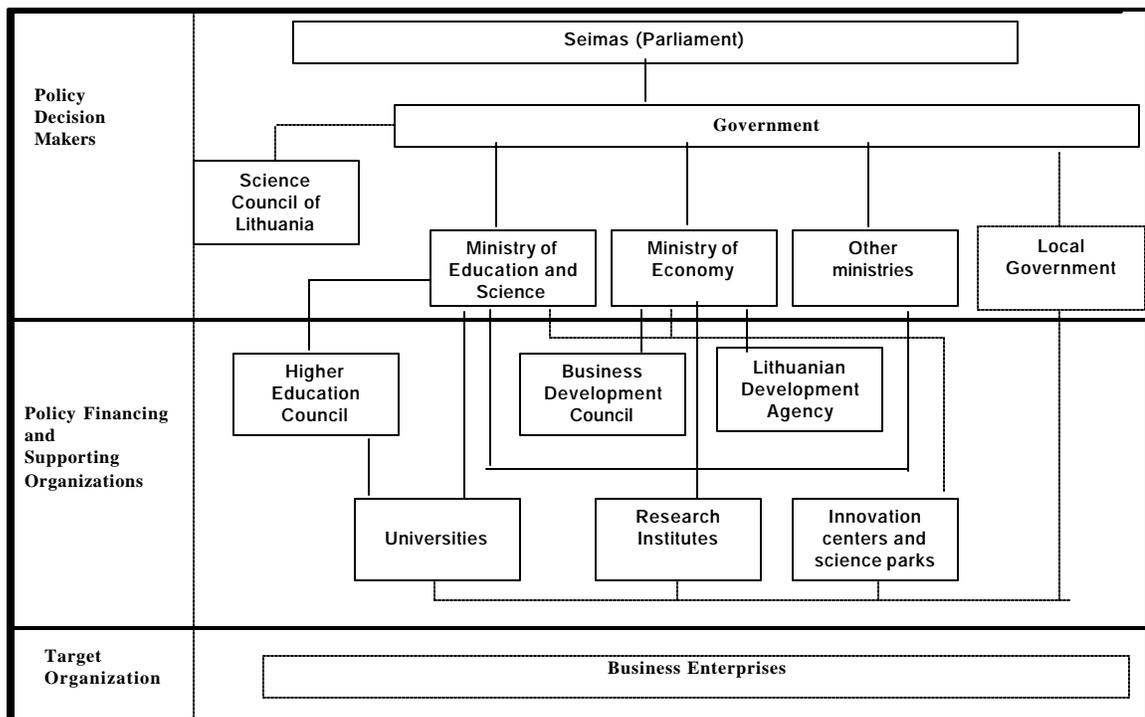
Aging of researchers and brain drain

18. Among the acute problems in the state research and higher education institutions is the age of researchers. More than 60 percent of scientists are over 50 years old, and 25 percent are over 60. To satisfy minimal regeneration needs, it has been estimated that 300-400 young scientists need to become researchers working in R&D. But only 150 doctoral degrees are granted each year. In addition, younger scientists and even more senior ones go to the West, because salaries in Lithuania are very low, scientific careers are arduous, and the gap in salaries between academia and industry is large. A researcher often has to have several income sources to pursue research in public institutions.

Large number of public institutions involved in R&D

19. The large number of public institutions involved in R&D results in too little decision-making and policy implementation. Figure A3.1 categorizes some of the major players in the Lithuanian innovation system into three groups according to the role they play: policy decision-makers, policy support and implementation agencies, and the target organizations.

Figure A3.1: Institutional Setting for R&D in Lithuania



- The *Ministry of Higher Education and Science* is in charge of preparing and executing government R&D policy. It analyzes the application of laws and government decrees related to higher education and R&D, prepares drafts of by-laws, coordinates and implements international programs in education and R&D, and makes proposals for the establishment, reorganization, and cessation of higher education and research institutions.
- The *Ministry of Economy* is in charge of preparing and executing government policy for industry, energy, foreign and internal trade, and ecology and waste management. The Lithuanian state budget funds for industrial policy implementation are allocated among three major programs: a program to strengthen industrial competitiveness (including subprograms such as the Innovation in Business Program, National Quality Program, and Sustainable Industrial Development Program), the Export Promotion and Development Strategy Implementation Program, and the Small and Medium-Size Business Development Implementation Program. The priorities of these programs are set out in the National Development Plan. This plan and the national programs form the basis for industrial policy implementation.
- The *Science and Technology Council* was recently established under the prime minister to coordinate innovation policies among government ministries and the research community. There is limited private sector representation. The council meets irregularly and has no secretariat to support its policy formulation and coordination role.
- The *Science Council of Lithuania* serves as a scientific adviser and consultant to the Seimas (Parliament) and the Government in solving strategic issues of research and higher education. It analyzes the situation in the research and higher education system in Lithuania, makes proposals and drafts decrees for the Department of Science and Higher Education, puts forth proposals about the right of institutions to confer doctoral degrees, supervises the award of research degrees and academic titles, and provides notification of doctoral degrees issued for Lithuanian citizens abroad.
- The *Higher Education Council* advises the Ministry of Higher Education and Science on issues of strategic development in higher education. The main tasks and functions of the council are to analyze and evaluate the development strategy for higher education in Lithuania, advise the Ministry of Higher Education and Science, develop proposals for the ministry, and draw conclusions on issues relating to the development and enhancement of higher education.
- The *Lithuanian Academy of Sciences* is an autonomous, state-subsidized scientific establishment bringing together distinguished Lithuanian scientists as well as foreign scholars whose activities are related to Lithuania. The academy serves as an independent advisory body to the government on scientific, educational, cultural, economic, technical, and social advancement.

- The *Lithuanian Center for Quality Assessment in Higher Education* was founded to maintain a high level of higher education. The center evaluates new study programs, analyzes data received after self-evaluations by institutions, analyzes the situation in particular institutions, and makes proposals for the Department of Science and Higher Education.
- In addition to these entities, several other public or semipublic authorities play a role in shaping the Lithuanian R&D and innovation system. These include the Lithuanian University Rectors' Conference, the Directors' Conference of Lithuanian Colleges, the Conference of the Chairmen of the Senates (Councils) of Institutions of Higher Education and Science in Lithuania, and the State Research Institute Directors' Conference.
- The *Lithuanian Innovation Center* is a nonprofit organization whose main purpose is to encourage and develop the scientific potential of Lithuania, preserve scientific traditions, increase the economic competitiveness of the country, create new workplaces in innovative enterprises, and ensure the successful integration of Lithuania into international markets. The *Science and Technology Park* is a nonprofit organization formed by three scientific institutions to manage the establishment of innovative new companies based on promising technology and to provide an interface between academia, research work, and the commercial development of products and processes. The *Institute of National Development* is a nongovernmental, nonprofit organization whose purpose is to seek the most appropriate solutions in key areas of state development, building proposed solutions around political willingness, practicability, and scientific competence. The *Northern Technology Park* in Vilnius, created by the city and by Vilnius University, is an example of a technology park with biotechnology companies.

Promising steps in international research cooperation

20. In 1992, in pursuit of integration into international science and technology development programs, Lithuania joined the European research and development cooperation program, EUREKA, and the European cooperation in science and technical research program, COST, enjoying the same rights as an EU member state. Between 1992 and mid-1999 Lithuanian research and higher education institutions and enterprises participated in only four EUREKA projects. But over the last two years Lithuanian institutions began implementation of 12 other research projects, including three that they are co-coordinating. The most active participants among research and higher education institutions are the Institute of Physics and the Kaunas University of Technology. Since 2000 Lithuanian research and higher education institutions have become actively involved and have participated in 24 activities under the COST program.

21. On October 1, 1999 Lithuania was admitted as a participant in the European Union's Fifth Framework Program for research and development. This was the first international cooperation program in which Lithuanian scientists took part on an equal basis with colleagues from the European Union. Lithuanian scientists took an active part in submitting projects in biotechnology, information technology, and environmental protection. A few small and

medium-size enterprises and organizations involved in innovation activity have also taken their first steps in EU cooperation. As of April 2002 Lithuanian institutions had submitted 470 project proposals, of which 131 had been approved. The gross success rate of participation in the program is 28 percent, a high rate compared with that for other EU candidate countries participating in the Fifth Framework Program.

22. Lithuania has signed intergovernmental agreements on cooperation in education, science, technology, and culture with many European and Asian countries as well as with the United States. Cooperation contacts have been established on the basis of intergovernmental agreements and agreements among institutions that coordinate education and science. Such contacts provide good possibilities for becoming acquainted with the education and R&D systems in other countries.

Outdated R&D financing instruments

23. Besides low levels of R&D funding, numerous other funding issues persist. The quality of spending has not adjusted to the requirements of a market economy. A major part of government financing consists of institutional funding for R&D institutions—lump-sum budget transfers provided to institutions on a per capita (employee or student) basis—designed to maintain existing staff, facilities, and equipment. Only a small fraction of government financing has been allocated to support what the Government itself has defined as its priority objectives for research. Moreover, R&D funding on the basis of competitive grant selection procedures has been modest by any standards. Program or project funding is close to zero in Lithuania; this compares with a share of program/project funding of R&D spending in EU member countries of 22 percent on average, and, for example, 41 percent in Finland, 40 percent in Denmark, 33 percent in Sweden, and 31 percent in Germany.⁵

Absence of an innovation policy framework

24. Not only the institutions that perform R&D are fragmented and isolated in Lithuania; so is the public administration that deals with R&D and innovation. In government R&D the dominant player in Lithuania is the Ministry of Higher Education and Science. It controls a major part of the financial and other resources and is responsible for most or all of the policies for R&D and for the implementation of these policies. The Ministry of Economy and some other ministries have played a growing role in relation to innovation and particularly to industrial innovation, but so far this has been reflected in interministerial cooperation and decision-making.

25. The important lesson to learn from the experience of more advanced countries is that the number of policy issues with strong links to innovation is increasing and that the boundaries between policies aimed at promoting innovation are becoming—and must become—unclear. That is why in many countries the old term *science and technology policy* or *research policy* has been replaced with *innovation policy*.

26. Thus Lithuania has a growing need to redefine and clarify the division of existing tasks and responsibilities between the key ministries with a stake in R&D and to increase the links

⁵ European Commission, *Benchmarking of National Policies*, 2002.

among different actors. The policy framework for innovation should complement broader structural reforms in many fields by focusing on several key objectives: building an innovation culture, enhancing technology diffusion, promoting networking and clustering, leveraging research and development, and responding to globalization.

A focus on basic science, not applied

27. In recent years governments in most EU countries have shifted their attention toward funding more application-oriented activities. In Lithuania the focus of science and education should unquestionably be shifted from basic research (keeping in mind that not all "basic" science in Lithuania is basic science as that term is defined in OECD countries) toward economically relevant applied research. But in small countries like Lithuania there is also a need for public investment in basic research and in industrial technologies. The development of basic research can and must be goal oriented, targeting economically and socially beneficial fields of technology, building up creative research capabilities, and securing the basis for technology innovation. (This is also true in larger countries.) This requires linking investments in basic science with stricter conditions and more concrete performance measures, as is now done in larger OECD countries.

Weak R&D evaluation procedures

28. As resources grow and individual policies, organizations, programs, and structures have increasing impacts, a natural consequence is that governments see an increasing need to more clearly evaluate the effectiveness of these mechanisms. In Lithuania until now, R&D evaluation has been minor, and the country has been dependent on foreign evaluators. R&D evaluation should be raised as an important issue, and more permanent evaluation practices developed. In addition, the increased complexity and the dynamics of the innovation system require a better understanding of major developments and trends in the national innovation system and in its environment. This requires focused attention from policymakers, and a sufficient number of specialists studying national innovation systems and producing information and data on such systems for use in policymaking.

Regional dimension

29. Regions and localities within countries have become increasingly important platforms for innovation policy. This is true of Lithuania as well. The main idea, an idea that has already been applied, for example, in the Vilnius and Kaunas regions, is that measures should be adapted to the structures and potential of individual regions (box A3.1). The concepts of clustering, science parks, technology centers, and incubators are good examples of regional development approaches, though they can also be developed at the national level, as has been done in Finland.

Box A3.1: Vilnius—a Knowledge Economy City

The local government in Vilnius is supporting knowledge-based initiatives and increasing the city's attractiveness by providing tax incentives and increasing land availability. Currently the city is proposing a reduction in the tax on commercial buildings to support high-tech companies and to encourage them to relocate in the technology parks rather than the center of the city. Vilnius is determined to overcome such threats as brain drain, lack of adequate intellectual property protection, and a growing digital divide by continuing with aggressive reforms aimed at effecting a transition in Lithuania from a labor-based economy to a more progressive, knowledge-based one.

Vilnius provides a good example of a clear strategic vision for a knowledge economy and a plan for information technology development, one that could be used as a model for other major cities in Lithuania. Under the Vilnius City Strategic Action Plan for 2002-04, there is much interest in developing cluster-based economic growth activities. The priorities of the plan include increasing competitiveness, improving the marketing of the city (at the international level), developing a modern, knowledge-based economy, and fostering a closer relationship between the city and the university.

To ensure successful implementation of the knowledge economy strategy, a civil society forum—the Knowledge Economy Forum—was established in 2001 to ensure that all major stakeholders are included in the decisionmaking process. The forum, which addresses major issues and challenges in the Lithuanian economy, brings together politicians and representatives from universities, a few NGOs, and prominent businesses in high-technology and biotechnology industries. In addition, the Knowledge Economy Forum, the local government, and Vilnius University have signed a memorandum of understanding to promote the development of Vilnius's knowledge economy. This has produced such projects as Sunrise Valley (based on the Silicon Valley model), aimed at increasing the transfer of technology between universities, industries, and municipalities in the technology parks.

To increase civic engagement and strengthen the monitoring of the quality of the business environment in Vilnius, the government is improving access to the Internet, making weekly broadcasts on local television, submitting articles to the Lithuanian national newspaper on knowledge economy initiatives, and organizing monthly breakfasts between the mayor and local business owners.

Source: <http://www.vilnius.lt/>.

Challenges in the business sector

30. Small and medium-size enterprises play a crucial role in the Lithuanian economy. At the end of 2000, 99.4 percent of Lithuanian enterprises had fewer than 250 employees, and 95.6 percent had fewer than 50. Successful innovation systems depend critically on networking among the domestic and foreign business and academic communities and on cooperation with and support from the government in the form of a conducive business environment and legal framework, tax and other incentives, and participation by the private sector in formulating policies and strategies. To turn ideas, research, and technology into commercial applications also requires entrepreneurs, management talent, and financing. Medium-size and larger firms, particularly those backed by foreign investors, have an advantage over small firms because they often have strong links to sources of knowledge and access to commercial banks and the equity market for financing.

31. Both large, well-established firms and small firms have a role to play in developing and commercializing new technologies. Firms like Intel, CISCO, Microsoft, and Nokia have pioneered new technologies, but their success has led to market dominance, which can have a negative impact on small "go it alone" firms. Thus subcontracting (between large international firms and smaller domestic firms) has important potential for firms in countries like Lithuania—and has played an important role in Ireland and Israel. Box A3.2 describes a good example of subcontracting, between Vilniaus, Vingis and Samsung.

**Box A3.2: Vilniaus Vingis—Using Subcontracting
to Integrate into Global Networks**

Vilniaus Vingis is a Lithuanian company that has successfully integrated into global production and distribution networks through subcontracting. The company is one of the largest manufacturers of electronic components in Central and Eastern Europe. Its main products include deflection yokes for color picture tubes and flyback transformers for television sets and monitors. Yokes account for about 85 percent of its total output.

Samsung purchases about 37 percent of the yokes produced by Vilniaus Vingis. It uses the yokes in producing television tubes that then become part of the television sets assembled by Samsung and Philips. Another 30 percent of the yokes are sold to a Lithuanian company, Ekranas, where they become part of assembled television sets sold abroad. Ekranas itself accounts for 4 percent of Lithuania's total exports to Western Europe. Ten percent of Vilniaus Vingis's output is exported to Philips, Barcelona, and 7 percent to Philips, England. Another 10 percent is shipped to Thomson Polkolor in Poland, where it becomes part of television tubes sold all over the world through Thomson's distribution network.

Source: <http://www.vingis.lt/>.

32. Innovations also take place in small start-up companies that find it difficult or impossible to access financing and that lack access to networks that can provide management and entrepreneurial knowledge and talent. Such companies therefore need to rely on government-backed financing and technical assistance programs (often supported by international donors) and private equity financing with embedded technical assistance and management talent.

33. Small companies and foreign investors in particular depend on a favorable business environment to grow and innovate. Several surveys of the business environment have been done in recent years by the Foreign Investment Advisory Service,⁶ by the World Bank, and by the European Bank for Reconstruction and Development and World Bank together.⁷ These surveys indicate that access to capital is now less of a constraint, while access to knowledge and a skilled workforce is becoming an increasing concern. In the most recent World Bank survey, in 2001, firms reported increasing flows of foreign knowledge, and a large share of firms (27 percent) indicated that access to markets and technology embodied in foreign investments was the most important need. Only 16 percent put the need for more capital first. Ineffective and intrusive business regulations and licensing, tax regulations and enforcement, and deficiencies in the legal system are still major concerns.

34. As EU accession approaches, the Lithuanian business community faces major challenges in adapting to EU regulations and standards. This adaptation will require significant investments in retooling and process and management change to meet health, safety, environmental, and other standards. But it also provides an opportunity to introduce innovative and more competitive technologies, processes, and management practices. Government policies and programs need to support this retooling as well as knowledge transfer and networking among firms and the research and education communities.

Innovation in the enterprise sector

35. All enterprises innovate to stay competitive and to grow. In most countries technology enterprises are the most innovative. Lithuania is no exception. The largest and fastest-growing companies in Lithuania's technology sector are in telecommunications and information technology, despite the downturn experienced elsewhere in these industries. Beyond these two key sectors, Lithuania has developed important capabilities in areas with potential for higher growth, including biotechnology, pharmaceuticals, and lasers, optics, and other medical devices.

36. *Telecommunications.* A critical platform for the economic and social development of the country, telecommunications represents the largest technology-based sector of the economy. This market grew by an estimated 26 percent during 2001, reaching total revenues of around 836 million euros.⁸ Four major players are active in this market, although the incumbent Lithuanian Telecom (privatized in 1998) remains the largest, with nearly half the total revenues.

⁶ Foreign Investment Advisory Service, "Lithuanian Administrative Barriers," 1999.

⁷ World Bank, "Lithuania Country Economic Memorandum," 7 October 2002.

⁸ Estimates of telecommunications and information technology markets are from InfoBalt.

37. Mobile telephony has experienced rapid growth in recent years, with revenues increasing 45 percent in 2001, to around 226 million euros. Strong growth in the mobile segment is expected to continue for several more years as penetration begins to plateau.

38. Revenues from Internet services increased by an estimated 65 percent in 2001, to around 40 million euros.

39. *Information technology.* Hardware and software companies have also experienced strong growth in recent years. Total revenues of the information technology sector grew by an estimated 30 percent in 2001, to around 260 million euros—despite the global downturn in the sector. One indicator of information technology penetration is the rising use of personal computers, whose sales grew by more than 50 percent during both 2000 and 2001. The installed base of personal computers is now estimated at 280,000, a level of penetration that should permit continued strong growth over the medium term as the country converges with higher-income countries in the region.

40. The Lithuanian information technology sector is following a pattern similar to that in other countries: local firms start out as resellers for international companies and then begin to export services to industrial country markets and to expand their core business to other developing country markets. In Lithuania local firms are beginning to record success in exporting programming services to the Nordic countries—reflecting a high skill base and competitive local wages. In addition, international information technology firms are considering Lithuania as a base for offshore services to the Nordic region, following the example of Estonia.

41. Although not endowed with information technology on a scale of other countries (such as India), Lithuania has the potential to develop a modest information technology services industry for offshore clients.

42. *Pharmaceuticals and biotechnology.* Beyond information technology and telecommunications, pharmaceuticals and biotechnology are the most dynamic and active of Lithuania's technology-based industries. Two leading firms account for most of the revenues and exports. Total revenues for the sector are estimated at 20-25 million euros, with annual growth of 15-20 percent reported.

43. *Lasers and optics.* Lithuania has developed a small cluster of firms in lasers and optics, the product of military-related enterprises from the Soviet era. Around 15 firms are currently active in this sector, with 3 larger firms accounting for the largest share of revenue. Total revenues for the sector are estimated at 15-20 million euros.

44. *Information-technology-enabled services.* A new category of business known as information-technology-enabled or remote services has begun to develop in Lithuania. This sector has large growth potential in economies with skilled workers—particularly where populations have strong English and other foreign language skills. Customer service centers are typically the first area to develop, followed by a variety of back office operations (accounting, finance, benefits). Lithuania has a small but growing presence in this market. A promising

indicator has been the recent acquisition of a small local call center by an international technology company. Following acquisition, the new owner plans to expand the center rapidly.

Global value chains

45. Lithuania is increasingly participating in global value chains—the division of functions in production and marketing among cooperating firms working across national boundaries (boxes A3.3 and A3.4).

Box A3.3: Moving Up the Value Chain in the Apparel Industry

Competition from cheap producers in developing countries in the textile and apparel industry has been increasing the pressures facing firms in industrial countries. While relatively low wages now ensure the competitiveness of transition economies in this industry, preserving the competitive edge may become increasingly difficult as wages continue to rise. Thus rather than fighting an uphill battle of competing purely on costs, transition economies would benefit from repositioning themselves into a higher value added segment of the industry.

The apparel industry can be thought of as having three tiers: the lowest value added segment—standard products such as generic white dress shirts; the middle value added segment—time-sensitive products with some fashion content; and the highest value added segment—top fashion designer clothing.

The highest profits are to be made in designing and marketing rather than in apparel production. But it may take time for producers in transition economies to build a reputation that will allow them to supply the second tier of the market under their own brand names. An alternative strategy for these producers is to move from supplying the lowest value added segment to supplying foreign retailers in the middle tier.

Among the recent developments in the middle tier of the apparel industry are product proliferation and shorter product cycles, which are reflected in quickly changing styles and product differentiation. These developments have contributed to general demand uncertainty for both retailers and manufacturers, making demand forecasting and production planning more difficult.

In a world where producers must supply an increasing number of products containing time-sensitive fashion elements, speed and flexibility have become crucial. Rather than making planning and production decisions based on forecasts and guesses made months in advance of a selling season, firms now receive ongoing orders reflecting actual consumer purchases. Thus suppliers must be able to provide frequent deliveries, in smaller quantities and with diverse products. Moreover, suppliers are expected to do so with far greater accuracy in filling orders and meeting delivery standards than in the past. In short, the retail revolution has altered the basic rules of global competition for the apparel and textile industry.

To participate in this new system, a supplier must be able to:

- Label, track, and respond to product orders in real time on the basis of style, color, fabric, and size.
- Exchange (send and receive) information electronically on the current status of a retailer's products.
- Provide goods to a retailer's distribution center that can be efficiently moved to stores—that is, containers marked with bar codes indicating the contents and shipments of products ready for display in retail stores.

Proximity to the European Union gives transition economies a great advantage and makes them primary candidates for becoming suppliers to middle-tier apparel retailers. Moving up requires some investment in both physical and human capital. Yet as the example of the furniture producer Vilniaus Baldu Kombinatą indicates (see box A3.4), this is not beyond the reach of Lithuanian companies. While following this route carries some risks, not doing so may be an even more uncertain path.

Source: World Bank, "Lithuania Country Economic Memorandum" (2002), based on Abernathy and others (1999).

Box A3.4: Vilniaus Baldu Kombinas—Working Closely with a Multinational

As the case of Vilniaus Baldu Kombinas (VBK) demonstrates, establishing commercial ties with a multinational corporation may be a successful strategy for integrating into a global distribution network. Established as a small workshop more than a hundred years ago, VBK has since become one of the largest furniture producers in Lithuania. The company produces both home and office furniture and has a retail network that sells about 7 percent of its output. Since the Lithuanian furniture market is too small to support a company the size of VBK, the firm has to rely on exports. It exports about 93 percent of its production to Sweden, Germany, Belgium, the United Kingdom, Canada, the United States, and France. And it sells about 90 percent of its output to the Swedish company IKEA, which in 1999 named the VBK its best supplier in the Baltics.

The relationship between VBK and IKEA began in 1998, and the cooperation between the two companies has been close ever since. IKEA has provided support to VBK in technology, production organization, and personnel training. VBK is linked to IKEA's computer system through which invoices as well as payment and delivery information are processed. VBK is upgrading its computer system so that in the future it will be able to receive daily information on the sales of its products in IKEA stores abroad. Thanks to the upgraded system, orders will be placed daily rather than every few weeks as is now the case.

While relying so strongly on one customer might be perceived as a risky strategy, VBK is not concerned because it is one of the top 25 IKEA suppliers (among the 2,000 companies producing for the Swedish concern). Moreover, closer technological integration with IKEA will make VBK more competitive relative to other IKEA suppliers. VBK is the only company in Lithuania to be so closely integrated into the IKEA system.

Source: World Bank, "Lithuania Country Economic Memorandum" (2000, vol. 2, ch. 3); <http://www.vbk.lt/en/>.

46. For a small country, foreign direct investment (FDI) is critical to establish a place in the global value chain and is often an important source of technology and knowledge. A significant share of FDI inflows into Lithuania can be attributed to the privatization of large state-owned entities that began in 1998, and it is not known whether FDI will stay at the current levels after the privatization programs end. Even with the privatization inflows, Lithuania has received less FDI than most other EU accession countries. Lithuania ranks eighth (above Bulgaria and Romania) in cumulative FDI inflows per capita during 1993-2000, with \$658.

47. FDI has been clearly focused in the Vilnius region because of its modern infrastructure, technology park, and services support structure (figure A3.2). In 2001 the Vilnius region attracted \$556 million in FDI, 53 percent of the country's total FDI of \$1.04 billion.

Box A3.5: Ireland—Innovation through Foreign Direct Investment

Ireland has a long history of openness to FDI, dating from the 1960s. Policies for FDI have played a major part in the country's industrial and trading performance. In 1995, for example, foreign-owned companies accounted for 70 percent of Irish exports. Current FDI policies are aimed at maintaining Ireland's position as a strategically attractive location for FDI in an increasingly competitive and globalized environment but also at building up the capabilities of Irish companies in such areas as technology and marketing.

The largest share of FDI has continued to go to greenfield investments or expansions rather than mergers and acquisitions, the area of most rapid growth in other EU and OECD countries. Investments have been attracted by a range of incentives and favorable factors in the business environment, such as low corporate taxes and a young, well-educated workforce. FDI tends to be concentrated in knowledge sectors such as electronics, software, and pharmaceuticals, with the companies involved usually selling little or nothing on the Irish market.

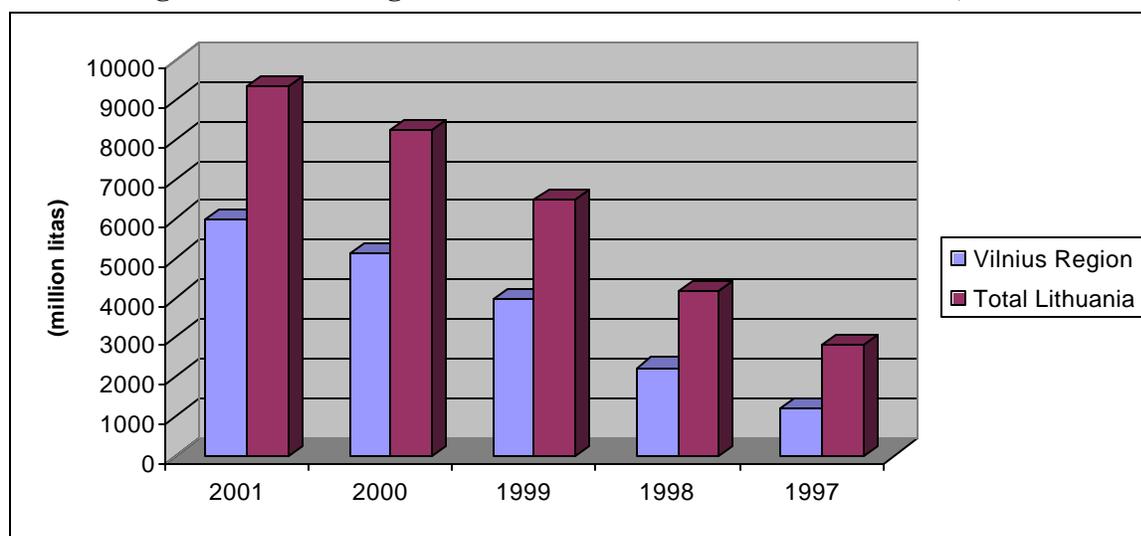
In the last few years there has also been rapid growth in outward FDI, with the inward and outward flows beginning to come into balance. Outward investment is undertaken for many purposes, such as gaining access to markets and benefiting from local research capabilities and knowledge spillovers.

FDI has made an enormous contribution to Irish exports and employment and has brought much-needed technology and expertise to an economy with a relatively small research base. But most multinationals have set up and operated Irish subsidiaries that receive the bulk of their technology from their parent corporations. The net effect of this is that the Irish economy continues to suffer from serious weaknesses in R&D and innovation despite the inflow of many world-class firms in nominally high-tech sectors. Whatever their deficiencies, however, the approximately 1,000 overseas firms in Ireland still fund and perform more than 75 percent of business R&D. By contrast, many domestic manufacturing companies continue to operate in the vulnerable, low-tech, traditional sectors.

The government-sponsored National Competitiveness Council has recently stressed that the fundamental drivers of the technologically advanced sectors of the economy—the core knowledge assets in human capital, R&D and innovation, and global management expertise—reside abroad. Thus it strongly recommends that Ireland now seek a competitive advantage by building up its own capabilities in core knowledge assets. It notes that recent international competitiveness benchmarking and national analysis have revealed serious gaps in Ireland's technological capabilities. The key aims of Irish science and technology policy are to encourage companies to develop their own research activities, to develop a world-class research environment in higher education and state research institutions, and to ensure a pool of high-quality, technically literate graduates to serve the needs of these companies and to start their own enterprises.

Source: European Commission, DG Research, *Benchmarking National Research Policies: The Impact of RTD on Competitiveness and Employment* (Brussels, 2002); Ireland, National Competitiveness Council, *National Competitiveness Challenge 2001* (Dublin, 2001).

Figure A3.2: Foreign Direct Investment Inflows in Lithuania, 1997-2001



Source: <http://www.vilniusregion.com/research.phtml>.

48. As Lithuania takes its place in global value chains, manufactured goods, machinery, and transport equipment have increased rapidly as a share of Lithuanian imports (table A3.2). This growth is an indication of significant investment activity and of embodied technology and knowledge being brought into the country.

Table A3.2: Structure of Lithuanian Imports, Selected Years, 1996-2001
(percent, except where otherwise specified)

| Item | 1996 | 1998 | 2001 |
|-----------------------------------|---------|---------|---------|
| Total value (millions of dollars) | 4,558.6 | 5,793.7 | 6,281.5 |
| Prepared foodstuffs | 5.9 | 4.8 | 3.9 |
| Animal and vegetable products | 7.3 | 6.1 | 5.8 |
| Minerals | 19.3 | 15.6 | 21.2 |
| Base metals | 6.8 | 6.2 | 5.2 |
| Wood | 0.7 | 1.1 | 1.3 |
| Manufactured goods | 57.3 | 64.5 | 60.6 |
| Chemical products | 9.4 | 9.2 | 9.2 |
| Other manufactured goods | 29 | 24.6 | 23.2 |
| Machinery and transport equipment | 18.9 | 30.7 | 28.2 |
| Other | 2.8 | 1.7 | 2.1 |

Source: Department of Statistics

Business environment and regulatory framework

49. Entry, operations, and innovation in Lithuania are hampered by business regulations and administrative barriers. Business surveys have concluded that the business environment is not conducive to innovation and that in several respects the business environment is less favorable than that in other EU accession countries. The unpredictability of regulations, frequent changes in regulations, and insufficient information and consultation with business are considered key problems.

50. International surveys of corruption put the level of corruption in Lithuania among the lowest in the EU accession countries. The World Bank and European Bank for Reconstruction and Development conducted a Business Environment and Enterprise Performance Survey (BEEPS) in 1999, asking enterprises to evaluate economic governance and state institutions and to assess the extent to which the business environment creates obstacles to the growth of their business. While the survey identified a relatively low level of state capture in the Lithuanian economy, the level of administrative corruption—or bribes to public officials to distort the prescribed implementation of laws, rules, and regulations—was evaluated as high. The results of the second BEEPS (in 2002) represent a significant improvement in the business environment in Europe and Central Asia as a whole. At the time of writing, Lithuania-specific results were not available.

Government programs to support business innovation and small enterprise

51. The Lithuanian government's policy for support of small and medium-size enterprises is based on the "Small and Medium-Size Business Development Strategy until 2003," enacted in mid-2000, which identifies 27 actions to upgrade the legal and economic environment, facilitate access to finance, further develop the business support infrastructure, and improve access to advisory and training services. The main channels for this support are:

- *Lithuanian Development Agency for Small and Medium-Size Enterprises (SMEDA)*. SMEDA was established in 1996 as a nonprofit organization and in July 1997 reorganized into a public institution. The agency operates under the management and supervision of the Ministry of Economy. SMEDA's primary goal is to support small and medium-size enterprises in increasing competitiveness and start-up business creation.
- *National Regional Development Agency*. The National Regional Development Agency is a public nonprofit institution established in 1999 and partly funded by the state. Its shareholders also include the Lithuanian Association of Chambers of Commerce, Industry, and Crafts; and the Kaunas, Klaipeda, Panevezys, Siauliai, and Vilnius Chambers of Commerce, Industry, and Crafts.
- *Lithuanian Development Agency*. The Lithuanian Development Agency was created to facilitate economic development through import and export promotion.

- *Regional Development Agencies.* The regional development agencies function at local level with the same responsibilities as the National Regional Development Agency. Their integration with the local community allows greater and deeper understanding of rural areas.
- *Business Advisory Centers under PHARE.* Under the EU-funded program PHARE, many business advisory centers have been established in Lithuania. These business support centers provide entrepreneurs with access to a wide range of services: business consultation, training, seminars, business plan drafting, marketing, partner research, and international projects. In addition to those supported by PHARE there are currently five business advisory services in Lithuania.

52. As in many OECD countries, the Lithuanian government (and international donor) programs cover support mostly for small and medium-size enterprises, ranging from technical assistance and training to grant, loan, and guarantee schemes for investment. The worldwide experience of such programs is mixed. Their success depends very much on the macroeconomic, policy, and institutional environment in which they are carried out and on the effectiveness of state and regional administrations and the level of corruption.

Finance for entrepreneurship and innovation

53. The best source of support for early-stage, high-growth firms is often investors, which typically provide more than pure capital investment. True value-added investors provide guidance on a range of business issues, such as marketing and strategic partners, financial management, and general operations.

54. Given the scarcity of resources at the seed and growth stages, equity investment can provide a good alignment of incentives between investors and management. The classic principal-agent problem, in which the incentives facing management can conflict with the owner's interests, is addressed by the investors becoming actively involved in the operations of the firm. A close relationship between investors and the company offers potential benefits to both sides, transferring much-needed mentoring and advice while helping to reduce the risk profile of the investment. Without a close relationship, the risks of early-stage investing escalate rapidly. Achieving a mutually beneficial relationship between investors and firm managers is often difficult, and works only if both sides understand the rules of the game.

55. The role of external finance changes with the stage of the company's growth, with the most proactive support needed early on (table A3.3). In the early stages of a company's life, proactive investors can add significant value by becoming directly involved in key management decisions, providing links to markets and strategic partners, and helping to guide expansion of the business. As the firm grows, the sophistication of the financial advice required increases and the need for linkages to larger markets grows.

56. For the relationship between investor and entrepreneur to work well, expectations must be aligned carefully and the legal provisions of the investment must work in tandem with the business relations. The legal framework should support the contracting arrangements needed for

early-stage investment relationships. In developed markets a variety of flexible and enforceable instruments are generally used for early-stage investing. Preferred equity is the classic instrument, as it can be tailored to give investors the required management control and ability to exit while preserving an “upside” in equity appreciation for management. This structure works to align the incentives of both sides to work together. Other instruments, including convertible debt (a loan that can be converted into equity), warrants, and options (the right to purchase shares at a future date), are also used to tailor the incentives and rights of investors and management or employees.

57. The Lithuanian investment management industry has developed rapidly from a low base in recent years. Though the industry was funded originally from bilateral and multilateral institutions, the country has increasingly attracted private investors, primarily from the Nordic countries. Eight to 10 venture funds are currently active in Lithuania, with more than \$130 million in uncommitted funds.⁹ These funds have approximately \$55 million in committed investments in the country.

Table A3.3: Financing Growth Companies—By Stage of Investment

| Stage | Typical investment size | Funding source | Characteristics |
|--------------|--------------------------------|---|---|
| Seed | \$10,000-\$500,000 | “Angel” investors (experienced entrepreneurs); family and friends | Experienced entrepreneurs with strong business contacts can be the best source of funding at this stage |
| Early | \$500,000-\$5 million | Venture capital funds | Mentoring and business contacts provided by funding source continue to be important |
| Expansion | More than \$5 million | Venture capital funds, other private equity funds, banks | International business relationships become more critical |
| Exit | | Strategic partner, initial public offering on stock market | Without successful exits, no new investments will be made |

⁹ All funds identified were pan-Baltic funds, with the exception of Vilnius Bank Risk Capital.

58. *Seed stage.* The angel investor community, which provides the largest source of seed-stage financing in industrial countries, is poorly developed in Lithuania. Seed-stage investors are often viewed as predators by managers, who prefer to “bootstrap” their operations through use of retained earnings or family funds. Bootstrapping not only can slow the expansion of the firm, but also forces it to forgo the business relationships and mentoring that angel investors can bring. The most important step in increasing the availability of seed-stage investment in Lithuania would be to improve the mutual trust between angel investors and companies—through networking opportunities and wider awareness of international investment practices.

59. *Early stage.* The financing of early-stage growth capital in Lithuania suffers from a set of problems similar to those facing seed-stage investment. Following the seed stage, funding from more formal channels such as venture capital funds is required. But the owner-managers of early-stage companies in Lithuania are often reluctant to dilute their control and typically do not perceive the potential value addition of investment groups. This perception is likely to stem from the entrepreneurs’ lack of experience with the investment community as well as a low level of value addition by some funds.

60. The legal framework for venture investing in Lithuania has major gaps that undermine the ability of investors and management to create an incentive system that aligns the interests of both parties. The legal framework for investment in early-stage companies remains underdeveloped, allowing a very restricted set of instruments. Common equity is the only instrument typically used in the country. The limited variety of financial instruments forces investors to create second-best solutions that have not proved to be legally enforceable (table A3.4).

61. At present, the local venture capital community does not see these shortcomings in the legal framework as a major constraint. But if the Lithuanian investment industry is to mature and attract additional capital, international legal norms for private equity investing (and the corresponding regulatory and supervisory framework) will need to be introduced.

62. *Expansion stage and exit.* Only a small number of Lithuanian firms have reached the expansion stage, in which more sophisticated financial structuring and other services are required. Experienced service providers for this stage of a company’s growth are scarce in Lithuania, and supplemental services may be required from international firms for a specific transaction. In any case, many exit transactions (such as the sale of a company to a strategic partner or an initial public offering on a stock exchange) are likely to engage international partners—to increase exposure to export markets and the ability to build scale.

63. The legal framework also needs to allow provisions that facilitate investor exit from a company. A major provision used in other markets to help ensure an investor’s ability to exit—the “liquidation preference,” in which investors have rights to the proceeds of a sale prior to management—is not possible in Lithuania. Other provisions that can facilitate exit, such as those allowing investors to “drag along” other shareholders in the sale of the company are allowed.

Table A3.4: Legal Constraints to Growth Investing in Lithuania

| Constraint | Issue | Relevance |
|--|---|--|
| Preference shares (equity with a dividend) are highly restricted. | Preference shares lack voting rights, have no preference in liquidation of the firm, lose their preferred status if the dividend is not paid for two years, have a dividend capped at the government bond rate, may constitute a maximum of one-third of the total shares of the company, and cannot be issued by companies with fewer than 100 shareholders. | This classic instrument of venture capital investing needs to be given great flexibility in structuring to facilitate contracting on issues of compensation and risk mitigation for investors as well as defining provisions for corporate governance. |
| Convertible debt (loan that may be converted into equity by the holder) is not legally enforceable. | This instrument is not provided for under the current legal framework. | This instrument is commonly used in investing in emerging markets and in other situations where an exit through a strategic sale or initial public offering cannot be assured. It is a basic component of the investment framework for growth companies, |
| Options for future purchase of shares by individuals (employees, management) may not be issued by a company. | A company cannot issue options for future purchase of shares. | Options form a key component of compensation packages for key employees in many growth companies and could benefit Lithuanian companies, |
| Warrants for future purchase of shares by investors (such as in the context of a loan agreement) are not possible for private companies. | Warrants for publicly listed companies may not be exercised beyond 12 months of issue. | Warrants give added flexibility to loan agreements and can have an effect similar to convertible debt. |
| Company debt issuance is restricted. | Bonds or other forms of debt may not be issued by a closed joint stock company; loans may be extended only by a bank. | Privately issued debt can be appropriate for an expansion-stage company. Although early-stage companies will seldom meet the criteria for debt financing (beyond a secured credit line), the prohibition on company-issued debt precludes an important instrument: convertible debt. |

64. Successful exits drive interest in the market from all sides—and are necessary to the health of the country’s economy and its ability to attract ongoing investment. The number of successful exits from private equity investments in Lithuania has been small, prompting concern from fund managers. A stronger track record in exits would clearly provide a major boost for the investment industry; however, the relatively small number of exits is more a symptom than a cause of the weakness of the local “ecosystem” for entrepreneurship.

Networking groups and “clusters”

65. Innovation does not occur in a vacuum. For good ideas to become viable businesses, technologists must find ways to work with business managers and investors. Companies need to work with one another, locally and across borders. Many countries have not yet developed strong local networks for entrepreneurship—and remain isolated from critical international networks. But in a growing number of countries the private sector has mobilized to create formal and informal networking groups with great potential for impact over time. The successful examples are led by small groups of forward-looking, dynamic individuals with ties to both the private sector and the government (and often with academia).

66. Networking groups can undertake a variety of activities ranging from basic functions—such as convening local and international events and gathering and disseminating information—to more sophisticated services—such as screening company proposals for investors and providing links to foreign and local business partners. In some cases networking groups provide training and coaching for angel investors and entrepreneurs on how to interact with one another, including on legal contracting issues. The main thrust of these initiatives is to build networks and connections between individuals for mutually beneficial relationships.

67. “Clusters,” or groups of firms engaged in a similar activity or sharing a common interest, sometimes take the networking activities a step further and pursue joint projects (incubators, policy reform, joint marketing projects). The interest in clusters is driven by empirical evidence that success in a given industry requires a critical mass of activity. Groups of firms in successful industries simultaneously compete and cooperate with one another. Small, isolated firms have a greatly reduced chance of success. The concept has received a great deal of attention in recent years; however, attempts to build formal cluster initiatives have often been derailed by organizational issues, overly ambitious goals, and lack of focus.

68. The international dimension to network building is central to ensuring that local firms are “plugged in” to key relationships abroad. One route to building relationships with international firms is through partnerships in the local market (such as with value-added resellers) that build the capabilities and contacts of local firms. Another is to use diaspora groups. Often criticized as “brain drain,” the emigration of skilled workers has a second face: a rich base of potential business contacts in international target markets. In the well-known case of India, ties with diaspora groups have proved critical to the success of the information technology industry. So emigration is not necessarily a bad thing: talented emigrants can become customers, mentors, and partners. But these links do not happen automatically. They can be effectively cultivated by private groups working with government (for example, consulates).

69. Lithuania has made important efforts in building local and international networks in support of entrepreneurship, particularly in the information technology sector. InfoBalt is undertaking some of these tasks for the information technology industry, organizing conferences and expositions and input to regulations and public policy. In addition, several cluster projects are under way to link universities with the business community in Vilnius and Kaunas. The Knowledge Economy Forum serves as a talking shop for the established technology companies in the country, with representation from the laser, telecommunications, information technology, biotechnology and pharmaceutical, and other sectors.

70. A major gap in the local environment is the lack of strong angel networks for mentoring and investing in seed- and early-stage companies. The country's relatively brief experience with a market economy has produced only a small pool of potential (and actual) angels. Moreover, firms remain suspicious of outside investment—because of the firms' own lack of sophistication and the poor reputation of many investors. Business managers in the country are often drawn from scientific or academic backgrounds and thus lack deep business experience. And firms often develop mentoring relationships with academics rather than experienced businesspeople.

71. Angel networking groups can help to jump-start relationships between firms and investors by clarifying the appropriate roles for both sides. Inclusion of diaspora groups in angel networks is another dimension that should not be overlooked.

72. The limited interaction of early-stage firms with experienced entrepreneurs is also evidenced by several of the university incubation programs. Without a base of experienced advisers from the business world to provide guidance to client firms, these incubators run the risk of becoming pure real estate operations with little value addition.

Intellectual capital

73. Intellectual property forms a key source of competitive advantage for firms in the technology sector. For a few select firms at the high end of the technological spectrum, "hard" intellectual property (formally documented intellectual property such as patents and copyrights) is critically important. For a far broader group of firms, however, "soft" intellectual property (trade secrets, proprietary business processes) is the primary value-driver.

74. A firm's initial stock of intellectual capital needs to be continually refreshed and upgraded to maintain its value in the marketplace. In-house research and development, outsourcing to contract research organizations, and collaboration with universities are potential sources of intellectual capital for a firm. But the more common sources of intellectual capital for a broader range of firms include learning by doing (for example, developing a proprietary solution for one client and producing variations for others), continual innovation through internal knowledge management and quality programs, and ongoing training and education of employees.

75. The framework for protecting formal or "hard" intellectual property in Lithuania is weak but improving. Copyright enforcement has posted the strongest gains. According to industry sources, software piracy has declined from 95 percent of all software utilized to 75 percent in

recent years. Although the gains are due in large part to increased enforcement by the Government, software vendors have made progress through partnerships with local hardware vendors.

76. The legal framework and enforcement are not viewed as sufficiently strong, serving as a barrier to foreign investment and growth of local firms.

Policy Issues and Proposals

Defining innovation policy in Lithuania

77. *Issues.* Current policies and institutions do not sufficiently reflect the importance and role of innovation as a primary source of competitiveness on the world market. A White Paper on Science and Technology has been prepared, but little action has been taken and the actions that have been are not fully consistent with the paper. It is too early to evaluate the work of the recently established Commission on Science and Technology, but without a permanent staff and with only occasional meetings, this commission does not appear equipped to address the challenges ahead. The recently adopted Law on Higher Education and Science introduces some positive changes; overall, however, Lithuania's innovation system is marked by an absence of meaningful goals, priorities for financial support (beyond the enumeration of selected themes), provision of instruments that explicitly support R&D activities, and a longer-term vision of a national innovation system. As a result, much of the research undertaken to date is irrelevant to the business community.

78. *Policy proposal.* The recently established Commission for Science and Technology should develop into a Lithuanian Science and Technology Policy Council modeled on the policy councils in Estonia and Finland. The key role of such a council would be to link the interests of business with those of the research and academic communities, ensure that research and education feed into the innovation process, and contribute to improvement in Lithuania's competitiveness. Council members would be nominated by the Government and include significant representation from the business and research communities. The council would be chaired by the prime minister alongside ministers from ministries with a major stake in R&D and innovation (Ministry of Higher Education and Science, Ministry of Economy, Ministry of Finance, Ministry of Interior).

79. Building on the Lithuanian Science and Technology White Paper, the central task of the council would be to prepare and agree on the vision, goals, and policies for longer-term development of the national R&D and innovation system; define specific policy instruments; and regularly assess the implementation of the council's innovation strategy and policies. This would include an analysis of developments, needs, and objectives of the national innovation system; the analysis would spell out policy instruments and funding tools (including R&D funding sources and targets) for public sector research and technology development and include recommendations for action by the private sector. To play this role, the council would need a secretariat with full-time professional staff support.

80. The council would build a common understanding and consensus on basic guidelines for innovation policy, aim to enhance partnerships between the business and research communities, and increase awareness and visibility of the role of innovation. The positive experiences with this model—such as in Estonia, Finland, and Ireland—could guide establishment of this high-level government institution.

Box A3.6: Policy Coordination to Improve Governance of the Innovation System

Most European countries have a national science and technology council to provide advice to the prime minister, the government as whole, or the parliament on strategic issues relating to the development of R&D or, more generally, the national innovation system. For example, Austria has the Council for Research and Technological Development; Belgium, the Federal Council for Science Policy; Denmark, the Council for Research Policy; Finland, the Science and Technology Policy Council; France, the High Council for Research and Technology; Germany, the Science Council; Ireland, the Irish Council for Science, Technology, and Innovation; the Netherlands, the Dutch Advisory Council for Science and Technology; and the United Kingdom, the British Council for Science and Technology.

In most countries the science and technology councils have proved to be effective instruments in preparing plans, proposals, and statements at the highest political level for the overall development of science and technology and for innovation policy issues. The operations of the councils have been further developed, and many countries plan changes aimed at strengthening the councils' position in the construction of the national innovation system.

Finland has had very good experiences with its Science and Technology Policy Council. The council, established in the 1960s, was reorganized in the late 1980s. Chaired by the prime minister, the council advises the government and its ministries on questions relating to science and technology. The council is responsible for the strategic development and coordination of Finnish science and technology policy and for the development of the national innovation system as a whole. The membership consists of seven ministers and 10 other members well versed in science and technology. The members are appointed by the Council of the State for a three-year term. The Science and Technology Policy Council has a secretariat consisting of two full-time chief planning officers.

The council has raised the status of R&D and innovation on political agendas, guaranteed continued attention to R&D issues (even during periods of changing government), and helped to achieve consensus on strategic guidelines relating to the growth and use of R&D resources. It has ensured a broad commitment to the implementation of the strategic decisions. And in a significant act after the economic recession in Finland in the early 1990s, the council initiated a program in 1996 to increase government investments in R&D in 1997-99 by \$250 million, an increase of about 25 percent in the state's annual research appropriations. The funds necessary for these additional appropriations were obtained mainly from the partial privatization of state-owned companies.

In *Estonia* the Research and Development Council was recently reorganized, with the idea being to link the council firmly with the Ministry of Economic Affairs and the Ministry of Education, just as in Finland. In addition to the council, both the central ministries in R&D have an advisory body of their own. The council, chaired by the prime minister, consists of ministers and high-level experts. In December 2001 the Estonian Parliament approved the Estonian R&D strategy for 2002-06. The principles of the strategy will be reviewed and updated by the government every three years, on the basis of proposals submitted by the Research and Development Council. This means that the council has become a central actor in the construction of the Estonian innovation system.

Source: http://www.minedu.fi/minedu/research/organisation/sci_tech_council/sci_tech_council.html;
<http://www.tan.ee/>.

Research and development: relevance, efficiency, accountability

81. *Issues.* The overriding challenge for the public R&D system in Lithuania is to increase its relevance, efficiency, and accountability. This entails significantly increasing the flexibility of R&D financing instruments, improving the efficiency of R&D organizations, upgrading the level of expertise (professionalism) in the management of public R&D funding, increasing the demand and need orientation among universities and research institutes, and promoting cooperation between industry and the research and academic communities.

82. *Policy proposal.* The Government should consider establishing a Lithuania Technology Agency to develop and implement new R&D funding instruments associated with revised innovation policies and priorities (see above), and working principles and processes for public R&D administration in Lithuania. In establishing such an agency, the Government should consider merging many of the public institutions now supporting innovation and business activities (the Lithuanian Center for Innovation, the Lithuanian Development Agency for Small and Medium-Size Enterprises, and others).

83. The main tasks of the agency would be to organize, finance, and evaluate new types of R&D programs in nationally significant fields of science and technology; to act as a national contact point for EU-related R&D activities (including national management of EUREKA and COST); and to provide grants and loans to firms for innovation projects. Many of the tasks of the agency would be new and would provide new thinking and orientation. In addition, however, viable existing operations and resources could be moved to the agency from their current homes in the Ministry of Higher Education and Science and elsewhere.

84. The agency could be placed under the Ministry of Economy or the Ministry of Higher Education and Science, but other solutions allowing more independence and credibility should also be elaborated. The experiences of such countries as Estonia, Finland, Ireland, and Sweden are relevant in this respect.

**Box A3.7: National Technology Programs in Finland—
Increasing Flexibility and Cooperation**

In Finland technology programs are used to promote development in specific sectors of technology or industry and to pass on research results to business in an efficient way. These programs have proved to be an effective form of cooperation and networking for companies and the research sector. In 2002 about 45 extensive national technology programs were being implemented. In 2000 TEKES provided \$160 million in financing for technology programs. Thanks to such programs, many new successful products and processes have been developed.

The planning of the technology programs takes place in working groups and open preparatory seminars involving companies, research institutes, universities, and TEKES, and the decision to launch a program is made by the board of TEKES. Each technology program has a steering group, a coordinator, and a responsible person at TEKES. The programs range in duration from three to five years, and in volume from \$6 million to hundreds of millions of dollars. Tekes usually finances about half the costs of the programs, with the other half coming from the participating companies. Most of the programs are evaluated by foreign evaluators.

The main benefits of the programs lie in the close cooperation among research institutes, universities, and industry; the broad involvement of small and medium-size companies; and the high level of international cooperation.

Source : <http://www.tekes.fi/>.

Box A3.8: The Hungarian Experience—Fostering Links between Industry and Research

To foster links between industry and research, Hungary establishes structures offering a stable platform for players involved in this cooperation: the Cooperative Research Centers, launched in 1999. These centers aim to stimulate long-term cooperative links between higher education institutions, R&D centers, and businesses. Their broad mandate includes fostering entrepreneurial attitudes in higher education institutions and incorporating a business orientation into their curricula, undertaking joint development of R&D activities for new products and processes to promote the competitiveness of firms, generating technological breakthroughs with commercial applications, and creating appropriate jobs for graduates and postgraduates. The centers can thus be seen as multifaceted instruments able to act on many aspects of the links between industry and research. By 2001 five Cooperative Research Centers were in operation in Hungary.

Source: <http://geoweb.cslm.hu/vhost/geoinfo/idrisi/default.htm>.

Box A3.9: Benchmarking National Research Policies in Europe

In endorsing the European Research Area initiative in March 2000, the Lisbon European Council called on the member states and the European Commission to develop benchmarking as a means of evaluating the performance of national research policies. As a core activity, the first benchmarking exercise for R&D policies in EU countries was launched to compare processes and performances and identify best practices.

The exercise concluded that there is a need to establish a stronger science base in Europe to ensure that the region is a global player. This implies coordinating national science and technology policies and national systems for higher education and moving toward a more open European labor market for researchers.

The second group of actions relates to national labor markets and education and training systems at large. The movement toward a European innovation and competence building system can take place only through a gradual renewal and a convergence of labor market practices and education.

To build the European Research Area, with its emphasis on Europe-wide networks of excellence, special attention will be required for the regional level. It is at this level, too, that policies supporting the absorptive capacity of small and medium-size firms will be needed, to strengthen and anchor local R&D and innovation clusters.

The EU governments are committed to boosting R&D and innovation in the EU by increasing expenditure in this area. The aim is to approach 3 percent of GDP by 2010, with two-thirds of the funding provided by the business sector. Among EU countries, only Finland and Sweden exceed this target at present, while the EU average is just below 2 percent. The current level of business expenditure on R&D, at 1.1 percent of GDP, also indicates the size of the challenge that EU countries need to address during this decade. Long-term cooperation among R&D and innovation actors—between public and private actors but also among private actors—appears increasingly critical for raising R&D investment and improving its effectiveness.

Source: European Commission, DG Research, *Benchmarking National Research Policies: The Impact of RTD on Competitiveness and Employment* (Brussels, 2002), and *Final Report of the Expert Group on "Public and Private Investments in R&D"* (Brussels, 2002);
http://www.tip.ac.at/workshops/presentation_borchard.pdf;
http://www.edis.sk/ekes/kneldok/dokument/bench_irce_0802.pdf;
ftp://ftp.cordis.lu/pub/rtd2002/docs/bench_ppi_0602.pdf.

85. *Issue.* Lithuania has 26 state research institutes covering a broad range of specialized fields of research, from humanities to technology. This fragmentation of institutions is inefficient: each institution requires administrative support, exacerbating the problem of scarce budgetary resources. The state research institutes should therefore reorganize themselves. Some of the institutes were recently integrated with Vilnius University. The relevance of the research undertaken is also in question. The state research institutes should consider shifting their orientation from basic research to applied research, from budget-financed research to research funded under contract and other external sources, and from an “ivory tower” orientation to one focused on supporting innovation for the business community.

86. *Policy proposal.* The reorganization of the state research institutes should be accelerated. One option would be to merge several institutes specializing in areas with potential for applied research and commercialization into a Lithuanian Institute of Technology focusing on applied (technological) research and contract research. The private sector should be invited to join this institute not only as users of its expertise and services but also as owners, financiers, and contributors to the research.

87. Regardless of the organizational arrangements, new funding mechanisms for the state research institutes should be developed, with (competitive) contract research figuring prominently among the financing sources. The growth and development of the Lithuanian Institute of Technology would be driven by external financing (EU funds, funds from the National Technology Agency, contracts with firms) rather than by budgetary allocations. Similar arrangements exist in other European countries—for example, the Fraunhofer Gesellschaft in Germany.

**Box A3.10: Specialized Technology Research Institutes—
a Device to Renew State Research Institutes**

The history of large as well as small economies in Western Europe teaches that technologically oriented public or publicly supported private research institutes are an important element of a successful R&D and innovation policy. These institutes are typically involved in a wide spectrum of activities, including strategic basic research, applied technical research, contract research, and testing and inspection. But their focus is clearly on commercially relevant applied R&D, carried out in close cooperation with firms and universities. Normally, a large share of the budget of these institutes is based on contract research with companies, with other financing coming from external sources.

Well-known examples of specialized technology research institutes are Fraunhofer-Gesellschaft in Germany, the Foundation for Scientific and Industrial Research (Sintef) at the Norwegian Institute of Technology, (TNO) in the Netherlands, the Danish Technological Institute, and the Technical Research Center of Finland. All of these have long experience, and all have played a significant role in their country in technology transfer and diffusion. And in recent years these research institutes have been significant actors in the EU research programs, particularly in industrial consortiums.

The *Fraunhofer-Gesellschaft*, founded in 1949, is the leading organization for institutes of applied research in Germany. At present the organization maintains 56 research establishments at locations throughout Germany. A staff of some 11,000, most of whom are qualified scientists and engineers, generate an annual research volume of around 900 million euros. Of this amount, more than 750 million euros are derived from contract research. Companies of all sizes and from all sectors of industry use the Fraunhofer Gesellschaft as external high-tech laboratories for all kinds of development work, for special services, and as expert consultants on organizational and strategic questions.

The *Danish Technological Institute* is an independent, not-for-profit institution approved by the Danish authorities to provide technological services to businesses and communities. Founded as an independent institution in 1906, the institute is one of the oldest of its type in the world. The institute has almost 900 employees and a turnover of some 90 million euros. The Danish Ministry of Trade and Industry invests some 16.8 million euros a year in the institute's R&D activities and dissemination of R&D results. The institute employs experts from different fields at 40 centers organized under the auspices of the six organizational units (energy, industry, environment, building technology, industrial development, and information technology).

The *Technical Research Center of Finland* (VTT) was established in 1942 as a government research institute. From the very beginning it has been a significant actor in the Finnish innovation system. The role of VTT, working under the auspices of the Ministry of Trade and Industry, has been to strengthen the competitiveness of Finnish commerce and industry through its technological expertise. While the universities focus on basic research, VTT concentrates on applied technical research aimed at commercial applications and active cooperation with enterprises. VTT employs 3,000 people and covers a large share of the fields of technology relevant to the Finnish economy. The basic government funding makes up no more than a third of its total budget. Much of VTT's financing comes from external sources—enterprises, government agencies, and the European Union.

Source: <http://www.fraunhofer.de/german/index.html>; <http://www.teknologisk.dk/>; <http://www.vtt.fi/>.

128. *Issue.* Practically all research in universities is financed by state budget resources that are allocated to universities as lump sums on an institutional basis. Universities further allocate these funds to established departments, largely in accordance with historically established norms (based on the number of students and past allocations). This allocation system contributes to the unresponsiveness of university research to industry demand, since industry demand has no influence on university funding decisions.

129. *Policy proposal.* To increase the relevance and accountability of research undertaken at universities, new, incentive-based, transparent, and flexible funding mechanisms for university research should be introduced, with increasing reliance on nonbudgetary sources of financing. The mechanisms should establish a clear division of funding allocations between educational purposes and research activities; establish procedures for flexible use of external financing, including contract research and training (budgeting, accounting, auditing, increased peer review); and allocate an increasing share of the current state budget funding and all of the future increments in such funding on a performance basis, with bonuses for excellent performance.

130. *Issue.* Because of the poor quality of statistics on the Lithuanian innovation system, there is no reliable database for longer-term policy planning and decision-making or for ongoing monitoring and evaluation of the system's performance.

131. *Policy proposal.* Urgent action should be taken to upgrade the quality of Lithuanian R&D statistics to the average OECD level on the basis of OECD recommendations (Frascati Manual). Correspondingly, innovation statistics should be developed to fulfill the requirements of the Community Innovation Survey. R&D evaluation methods and mechanisms could be developed along the lines of those in other countries, such as Finland, Ireland, Norway, and Sweden. To support the accumulation of knowledge on and experience with R&D and innovation-related analysis and studies, the establishment of a dedicated unit specializing in technology and innovation studies should be considered. This unit could be placed in the new Lithuanian Technology Agency.

Box A3.11: The Small Business Innovation Research Program

The Small Business Innovation Research (SBIR) program, sponsored by the U.S. Small Business Administration (SBA), is an interesting approach to bridging the innovation barrier. Established by the U.S. Congress in 1984, the SBIR program has several major objectives. It provides high-tech entrepreneurs with the startup capital they need to explore the commercial feasibility of high-risk research ideas, early-stage financing that venture capitalists traditionally have little interest in providing. It fosters the commercialization of government-funded R&D. It establishes productive, commercial links between high-tech small and medium-size enterprises and government-funded research priorities. And through its "graduates," it provides an excellent source of deal flow for venture capitalists.

Source: <http://www.reeusda.gov/sbir/>.

Business and regulatory environment

132. *Issue.* The business environment is not sufficiently supportive of innovation. Firms reported increasing flows of foreign knowledge, and a large share of firms (27 percent) indicated that access to markets and technology embodied in foreign direct investment is a critical factor. Only 16 percent put the need for more capital as a first concern. Ineffective and intrusive business regulations and licensing, tax regulations and enforcement, and deficiencies in the legal system are still major concerns.

133. *Policy proposals.* Work to simplify business registration procedures should continue, improving the legal framework and streamlining tax administration. Norms not required by the European Union should be critically reviewed, questioning their necessity and value for public policy purposes. More emphasis should be put on implementation to increase speed, transparency, and information flows.

134. *Issues.* Labor regulations are perceived as a more serious obstacle to business operations in Lithuania than in other Central and Eastern European countries. According to the Business Environment and Enterprise Performance Survey (1999), Lithuania ranked as the second worst among 10 EU accession countries in this respect. A more efficient and flexible labor market is also critical to reducing Lithuania's long-term unemployment and allowing labor markets to adjust to changing economic conditions. Lithuania today is marked by high unemployment and high job turnover, with the vast majority of new jobs (more than 70 percent) created by start-ups and small firms and mostly in the export sector. The labor market is segmented between the employed (with high job turnover and frequent moves from job to job) and the long-term unemployed. A similar duality exists, in terms of flexibility and working conditions, between small firms (high job turnover, high flexibility) and large ones (low flexibility). The minimum wage as established today limits the options for low-skilled workers. A number of labor market policies could be considered.

Policy proposals.

- Enhancing wage flexibility by reducing minimum wages as a percentage of average wages or by differentiating the minimum wage (for example, by introducing a youth subminimum).
- Promoting flexible forms of employment, including fixed-term contracts, to stimulate labor supply (for example, part-time work by women) and labor demand.
- Liberalizing the use of fixed-term contracts by removing the limit on the number of successive renewals while keeping the existing limit on total duration.
- Adopting the practice of annualizing working hours—that is, calculating weekly working hours on a yearly basis—and lowering the cost of overtime work.

- Allowing the social partners to “negotiate flexibly,” consistent with the worldwide trend. This would imply deregulating labor relations and devolving responsibility for determining them to the social partners, while the Government would be responsible for setting and enforcing only basic norms (including basic workers’ rights) and standards (World Bank, Country Economic Memorandum, 2002).

95. *Issue.* The multitude of government programs and agencies for business support pursue multiple objectives and often are not effectively coordinated and administered. It is not clear that these programs have a significant positive impact on innovation and in furthering the knowledge economy.

96. *Policy proposals.* Lithuania should undertake a systematic review of best practices employed in other countries on the design, operation, and coordination of business support programs aimed at fostering competitiveness, innovation, and growth. It is particularly important to review the multitude of dispersed subsidy programs, such as clusters, incubators, technology parks, industrial parks, business innovation centers, and loan, grant, and guarantee schemes. Ensuring that such programs are sustainable in the long term requires an understanding of the market failures they are assumed to address, the business needs and management challenges they face, and the conditions under which they can work well. Enterprises participating in these programs need technical and managerial know-how to develop and commercialize their innovations.

97. Lithuania should also consider merging all or some of its business support schemes under an umbrella organization, such as the Lithuania Technology Agency (proposed above).

98. *Issue.* The legal framework for investment in Lithuania is geared toward equity finance for larger, publicly listed companies and debt finance through commercial banks. Neither instrument is optimal for high-growth, early-stage knowledge-based companies. Companies at this stage are too risky for commercial banks because their cash flow is not sufficiently predictable—and security against fixed assets is often not practical. But the legal framework for private equity is not adequately developed, undermining the ability of outside investors and company managers or owners to create an incentive system that aligns the interests of both parties. The set of instruments available for private equity investing is severely limited. Among other things, the legal framework needs to allow provisions facilitating investor exit from a company.

99. *Policy proposals.* The forms of equity and quasi-equity possible under Lithuanian law should be brought into accord with international best practices. Demand for these more sophisticated instruments appears to be growing as the Lithuanian private equity industry matures. But more rapid legal reform could facilitate early-stage investment and attract the attention of international investors.

100. At present, shortcomings in the legal framework are not seen as a major constraint by the local venture capital community. But if the Lithuanian investment industry is to mature and attract additional capital, international legal norms for private equity investing (and the

corresponding regulatory and supervisory framework) will need to be introduced. A major provision used in other markets to help ensure an investor's ability to exit—the "liquidation preference," in which investors have rights to the proceeds of a sale prior to managers and owners—is not possible in Lithuania. Other provisions that can facilitate exit, such as those allowing majority investors to force other shareholders to participate in the sale of the company, are allowed.

Private sector interaction with public services

101. *Issue.* In industrial countries private sector organizations such as industry and employers associations have the capacity to formulate their own strategic proposals for the development of their industry as well as to review proposals made by the government. Although these organizations represent the interests of their members, they often look to broad, long-term interests rather than those of individual firms. To do so requires that private sector organizations and their members cooperate with one another in the interest of developing policies and joint activities conducive to all businesses. Taking a broader, more strategic view allows the private sector to provide more effective input to government policies and to launch initiatives of its own. The Lithuanian private sector is still far from developing such an organization, cooperation, and outlook.

102. The Government, municipalities, and the private sector cooperate on specific projects, such as clusters, incubators, technology parks, industrial parks, and business innovation centers. While in principle all these serve as vehicles for the effective transfer of knowledge and technology and spur innovation, their success depends on how they are designed and managed. Many are developed without necessary preparatory work to identify market needs and without adequate operating procedures and staffing. At best such entities provide some educational functions. They survive mainly on the state budget and international funds, since enterprises are unwilling or unable to pay for the services provided.

103. *Policy proposal.* Lithuania's private sector should take on a higher profile in developing its vision and strategy for the country's knowledge-based economy and in taking concrete steps to make this vision a reality. To do this, the private sector needs to develop its own organizations with the capacity to gather information, analyze policy issues, and communicate with their members. The private sector also needs to develop forums in which representatives from all parts of the private sector can meet and formulate positions on policy issues. This would help to improve the effectiveness of the private sector's partnering with the Government in formulating visions, strategies, and policies in policymaking and policy coordinating bodies for the information society and the innovation and education systems.

104. *Issue.* Accounting practices and information systems are still poor in the business sector, preventing the buildup of trust, the sharing of information, and cooperation. Good accounting practices contribute to the development of the knowledge economy in three ways. First, sound accounting practices support transparency and good governance, which facilitate business cooperation and networking. Second, they improve access to finance, especially equity and loans for early-stage innovation investments. And third, accounting standards aligned with

international practice improve the confidence of foreign investors bringing knowledge to Lithuanian companies.

105. *Policy proposals.* Lithuania is about to introduce new accounting rules and procedures that comply with international accounting standards. A new body should be established to develop accounting standards for limited liability companies, most of which are small and medium-size enterprises. This body should include representatives from both the private and the public sector. Moreover, there is a need to enhance the country's accounting and auditing capacity, by establishing closer links with universities and other educational actors to reform curricula and train or retrain accountants in the private sector. Business organizations should encourage and, if possible, enforce adherence to the newly adopted accounting standards and encourage their members to improve information systems and share information.

106. *Issue.* Despite the harmonization of the legal framework relating to the protection of intellectual property rights, many entrepreneurs and researchers still do not see the value of such protection. Ambiguities remain about who owns the intellectual property rights for government-funded research and development projects. Despite the Employee Agreement used by state research institutes and universities—according to which innovations by an employee are the intellectual property of the employer—many representatives of research institutes are unclear about the possibility of patenting innovations and their potential commercial uses. This ambiguous ownership status hampers commercialization and deters potential foreign investment in Lithuanian's intellectual resources.

107. *Policy proposals.* The Government (through the Patent Bureau) and the private sector (through the Association of Entrepreneurs) should develop information and training material about intellectual property rights. The ownership of state research should be clarified and incentives put in place for researchers to bring research results to the market.

108. *Issue.* Lithuanian exports are still based predominantly on low-skilled labor inputs with low technology content and quality. The drive for higher quality to attain ISO certification has fostered innovation in firms in more developed EU candidate countries. Few Lithuanian companies have obtained ISO certification. Lithuanian entrepreneurs seem to lack a general understanding of the need to certify their production processes according to international standards.

109. *Policy proposal.* Lithuanian enterprises and the Government should cooperate in raising awareness of the need for ISO certification and in training to help attain ISO certification standards.

Mobilizing the private sector

110. *Issue.* With networks for mentoring and funding early-stage companies still in the early stages of development, entrepreneurship in Lithuania is struggling. Firms remain wary of outside involvement, whether by local or international investors. Private investors often have little to offer beyond funding; strategic investors (larger companies) typically want complete control, leaving little role for the original management team. Cross-firm collaboration in such

areas as marketing, promotion, and networking also remains limited. The activities of private sector associations and networking groups to address these problems remain limited—in both sector coverage and depth of activities—particularly beyond the information technology and telecommunications sector.

111. *Policy proposal.* Private sector associations and networking groups should seek to deepen their activities in support of members and to extend coverage across the breadth of the knowledge economy in such areas as mentoring and networking for early-stage and high-growth businesses and international promotion and marketing. Organized mentoring networks can help firms obtain advice and support from experienced entrepreneurs. And private associations can play a key role in promoting and marketing Lithuanian companies and investment opportunities abroad.

112. To grow and compete, Lithuanian firms need strong ties to international markets and investors and the knowledge they harbor.

Annex 4: Building an Information Society

1. A knowledge economy is a networked economy in which information and communications technologies (ICT) are a key part. Access to electronic communications networks and ICT is decisive for economic growth, knowledge-based activities, and social inclusion and cohesiveness. Enterprises operating in the ICT sector are among the most innovative and dynamic in Lithuania, contributing to the development of a knowledge-based economy. Lithuania is a signatory of the eEurope + Action Plan aimed at promoting an information society in countries that are candidates for accession to the EU. The most recent progress report (June 2002) indicates a need to intensify efforts to achieve the agreed targets for an information society in Lithuania.

2. The World Economic Forum, in its *Global Information Technology Report 2001/02*, ranks 75 countries on their readiness for a “networked world.” Lithuania ranks 42nd, among the lowest of the EU candidate countries (table A4.1). This ranking is driven in part by current network use (or the current state of ICT adoption), on which Lithuania ranks 46th. The ranking is also driven in part by enabling factors likely to influence future development of an information society, on which Lithuania ranks 43rd. The enabling factors consist of network access (information infrastructure, hardware, software, support), network policy (ICT policy, business and economic environment), networked society (networked learning, ICT opportunities, social capital), and networked economy (e-commerce, e-government, general infrastructure). Lithuania does best on network access (31st) and worst on network policy (62nd). The results of the e-Europe + benchmarking exercise show that Lithuania is lagging behind in building an information society; for example, Lithuania has one of the lowest Internet use rates (around 15 percent) among the EU candidate countries.

Table A4.1: Readiness for the Networked World

| Networked Readiness Index | | Network Use | | Enabling Factors Subindex | |
|----------------------------------|-------------|--------------------|-------------|----------------------------------|-------------|
| Country | Rank | Country | Rank | Country | Rank |
| United States | 1 | Iceland | 1 | Finland | 1 |
| Iceland | 2 | United States | 2 | United States | 2 |
| Finland | 3 | Finland | 3 | Sweden | 3 |
| Ireland | 19 | Ireland | 20 | Ireland | 18 |
| Estonia | 23 | Estonia | 21 | Estonia | 24 |
| Portugal | 27 | Portugal | 25 | Czech R. | 27 |
| Czech R. | 28 | Czech R. | 28 | Portugal | 28 |
| Slovenia | 29 | Slovenia | 29 | Hungary | 29 |
| Hungary | 30 | Greece | 30 | Slovak R. | 31 |
| Greece | 31 | Hungary | 32 | Slovenia | 32 |
| Slovak R. | 33 | Slovak R. | 33 | Poland | 33 |
| Poland | 35 | Poland | 36 | Greece | 35 |
| Latvia | 39 | Latvia | 38 | Latvia | 37 |
| Turkey | 41 | Turkey | 39 | Lithuania | 43 |
| Lithuania | 42 | Bulgaria | 45 | Turkey | 44 |
| Costa Rica | 45 | Lithuania | 46 | Costa Rica | 45 |
| Bulgaria | 53 | Costa Rica | 48 | Bulgaria | 61 |
| Russia | 61 | Romania | 57 | Russia | 63 |
| Romania | 65 | Russia | 59 | Ukraine | 64 |
| Ukraine | 66 | Ukraine | 66 | Romania | 65 |

Source: World Economic Forum, The Global Information Technology Report 2001/02. Readiness for the Networked World

Information Infrastructure and Telecommunications Sector

3. The telecommunications sector is a key component of and contributor to an information society and knowledge economy. Its performance thus has a broad impact on economic and social development.

4. The most recent data on ICT in Lithuania suggest that it is slowly catching up with the other EU accession countries in Central and Eastern Europe. Yet if the data on fixed and mobile communications are encouraging, Lithuania still lags behind in Internet penetration and use. This may be mainly because of the high cost of access—the highest among the Baltic states—and the cost of equipment such as personal computers. Access costs have been declining slowly in recent years, and the opening of the telecommunications market to competition may support the trends commonly associated with free competition, such as falling prices and rising quality.

5. Lithuania faces several challenges relating to the telecommunications sector:
- The expiration of the exclusive rights of Lietuvos Telekomas in January 2003 and the need to provide the company with a new license.
 - Ensuring an orderly transition to a competitive environment in the fixed market (with appropriate safeguards for customers).
 - Expanding Internet access.
 - Extending rural access.
 - The transposition into Lithuanian laws and regulations of the EU *acquis communautaire*.
 - Building sufficient capacity in the Communications Regulatory Authority to enable it to be effective.

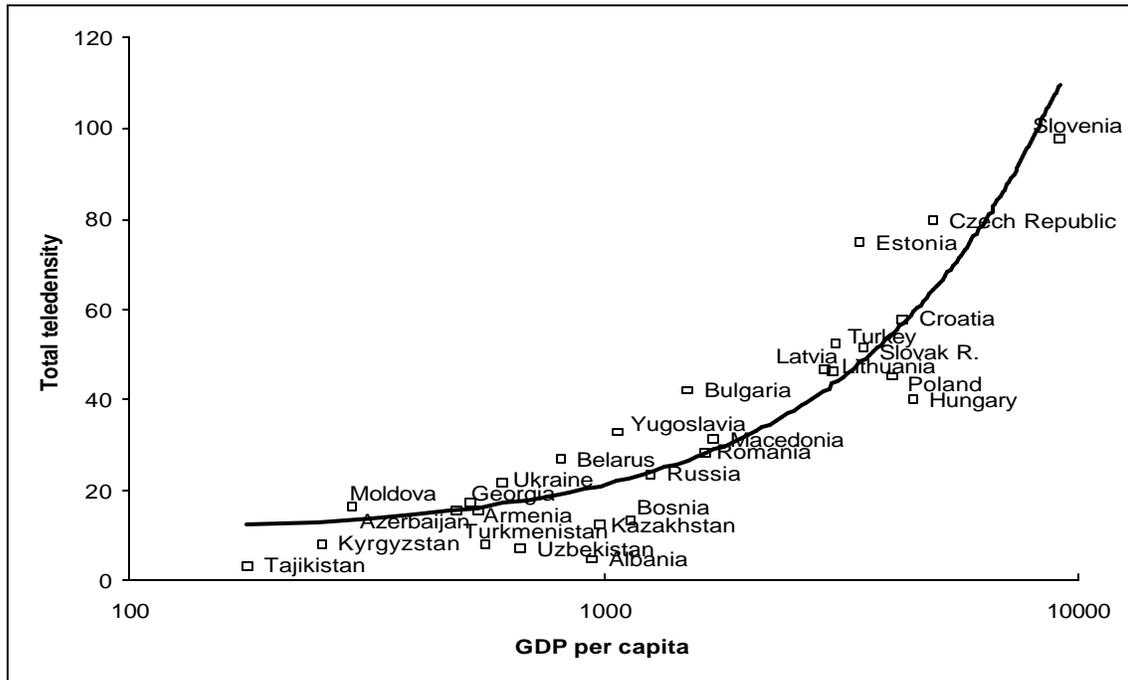
Telecommunications sector performance

6. Like all EU candidate countries, Lithuania must both transpose and implement the *acquis communautaire* before accession. It also must manage the transition to full competition. These processes are indivisible from the regulatory environment of the telecommunications sector. And they are made more complicated because the “Electronic Communications” *acquis communautaire*, which evolved in 2002, is untried in the EU candidate countries (and in the EU member states).

7. With three mobile operators and Lietuvos Telekomas competing for customers, Lithuania’s telecommunications sector is fairly vibrant, and at first glance its performance appears satisfactory in the context of the Baltics and Europe and Central Asia (figures A4.1, A4.2, and A.4.3). When total teledensity (fixed and mobile), the share of the population using the Internet, and the urban-rural teledensity ratio (the ratio of teledensity for fixed telephones in the largest city to that in the rest of the country) are plotted against GDP per capita, Lithuania’s position is:

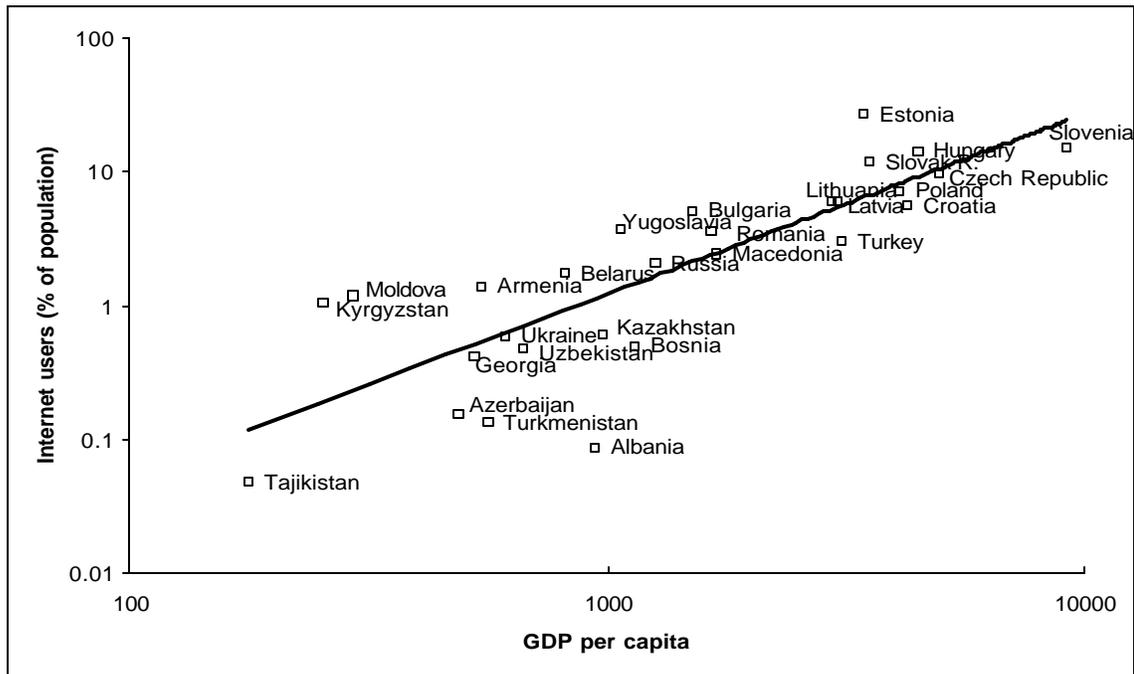
- Close to that predicted by GDP per capita.
- Close to Latvia’s position.
- Behind Estonia’s position—that is, with lower total teledensity, lower Internet use, and a bigger urban-rural gap in access to fixed telephones.

Figure A4.1: Total Teledensity (Fixed and Mobile) and GDP Per Capita



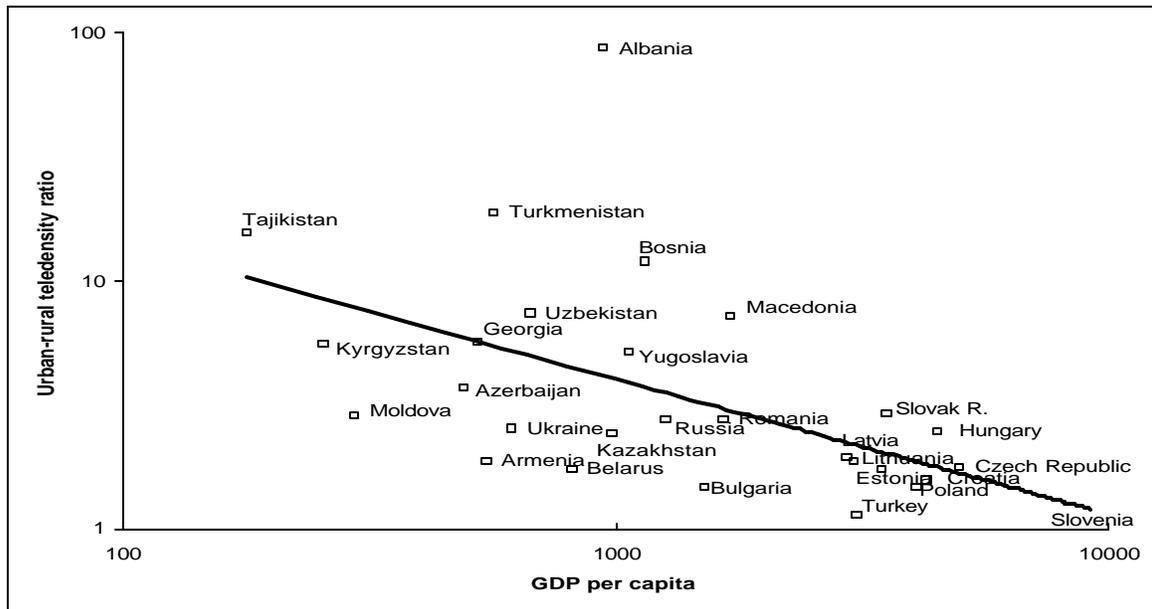
Teledensity: Number of telephones (fixed plus mobile) per 100 population
Source: International Telecommunication Union, World Bank 2001

Figure A4.2: Internet Users and GDP Per Capita



Source: International Telecommunication Union, World Bank 2001

Figure A4.3: Urban-Rural Teledensity Ratio (Fixed Access) and GDP Per Capita



Source: International Telecommunication Union, World Bank 2001

8. While Lithuania compares reasonably well with the other Baltic states, it could look to other EU candidate countries, such as the Czech Republic and Slovenia, as appropriate peers. Lithuania is comparatively rich in information infrastructure. Besides the networks of Lietuvos Telekomas and the three mobile operators, there are also those of the radio, television, Lithuanian Post, railways, electricity, cable television, and academic and research institutes. In the context of liberalization, a key challenge will be to mobilize these national resources to ensure sufficient access throughout the country.

Disaggregated sector performance

9. A disaggregated analysis of the performance of Lithuania's telecommunications sector reveals some serious weaknesses relating to the country's integration with the global economy, rural access, and development trends. Table A4.2 presents comparative data on two indicators of the performance of the Internet and its contribution to the economy—international Internet bandwidth (which measures the capacity of a country's connection to the World Wide Web) and Internet hosts per 10,000 people—for the Baltic states, other EU candidate countries, neighbors of the Baltics, and the United Kingdom. The results for Lithuania are not impressive.

Table A4.2: International Internet Bandwidth and Internet Hosts, 2001

| | International Internet bandwidth (Mbps) | Internet hosts (per 10,000 people) |
|------------------------|---|------------------------------------|
| Lithuania | 95 | 52 |
| Latvia | 262 | 99 |
| Estonia | 517 | 322 |
| | | |
| Bulgaria | 192 | 130 |
| Czech Republic | 11,467 | 162 |
| Hungary | 2,979 | 187 |
| Poland | 2,337 | 133 |
| Romania | 1,418 | 20 |
| Slovak Republic | 6,821 | 74 |
| Slovenia | 320 | 174 |
| Turkey | 865 | 34 |
| | | |
| Finland | 7,820 | 1,771 |
| Sweden | 60,390 | 1,695 |
| United Kingdom | 238,074 | 681 |

Mbps = megabits per second

Source: Telegeography, *Packet Geography 2002*.

10. Lithuania's performance on both measures is disappointing compared with that of Latvia and Estonia. The significant differences in international capacity indicate that Lithuania is less integrated with the World Wide Web than its neighbors. And the lower density of Internet hosts points to a relative scarcity of local Web servers.

11. Lithuania's performance may reflect domestic demand conditions. But compared with other EU candidate countries, especially the Czech Republic, Lithuania has poor integration, a state of affairs that could pose particular problems for developing a knowledge-based economy and employment. It is possible that the expiration of the existing exclusive rights in telecommunications will provide an opportunity for new entrants to expand international Internet bandwidth.

12. The tariffs charged for Internet access are an important determinant of demand for Internet services (table A4.3). Tariffs for dial-up Internet access combine monthly access fees and usage charges paid to the fixed network provider (both of which are very similar in the three Baltic states) and the charges of the Internet service provider (ISP). In Estonia ISPs provide

unlimited Internet access, and the cost of 30 hours of peak access is therefore substantially lower than in Lithuania, which has the most expensive Internet access of the three Baltic states. In 2001 the charges for 30 hours of off-peak access were US\$49.63 in Lithuania, US\$34.26 in Latvia, and US\$5.00 in Estonia.

13. The high charges in Lithuania could prove to be a significant impediment to demand and an obstacle to the development of a knowledge economy. A new business model for Internet access is required.

Table A4.3: Peak Tariffs for 30 Hours a Month of Dial-Up Internet Access, 2001 (U.S. dollars)

| | PSTN monthly access fee | PSTN usage charge | ISP charge | Total |
|------------------|-------------------------|-------------------|-------------------------|--------------|
| Lithuania | 4.30 | 0.70 | 63.00 | 68.00 |
| Latvia | 4.90 | 1.10 | 40.30 | 46.30 |
| Estonia | 4.40 | 0.80 | Unlimited access | 5.20 |

PSTN = public switched telephone network

Source: International Telecommunication Union, *World Telecommunications Development Report 2002*.

14. The low level of integration indicated by the data on international Internet bandwidth and Internet hosts is also implied by data on international telephone traffic for the three Baltic states (table A4.4). Although Lithuania has the largest population of the three Baltic states, it generates the fewest minutes of international telephone traffic and subscribers make substantially fewer international calls (measured in minutes) than do those in the other two countries. Though demographics and the nature of the diaspora may explain some of the differences, the data point to the more outward perspective of Latvia and Estonia—which may have implications for the development of a knowledge-based economy in Lithuania.

Table A4.4: International Telephone Traffic, 2000

| | Outgoing telephone traffic (millions of minutes) | Minutes per subscriber |
|----------------|--|------------------------|
| Lithuania | 34.9 | 33.2 |
| Latvia | 57.7 | 78.5 |
| Estonia | 78.1 | 149.4 |

Source: International Telecommunication Union, *World Telecommunications Development Report 2002*.

15. An important element of the “digital divide” is the distribution of access within countries. One way to assess this is to look at the size of the largest city relative to the rest of the country, the share of fixed lines in the largest city, and the teledensity in the largest city, the rest of the country, and countrywide. A comparison of these measures for the three Baltic states shows that

Vilnius does not contribute to the same concentration of population in Lithuania as Riga does in Latvia or Tallinn in Estonia—it accounts for less than half the population share of the other two capitals (table A4.5). As in Latvia and Estonia, in Lithuania teledensity in the capital is higher than that in the country overall, and teledensity in the rest of the country is lower than that in the largest city and in the country overall. By this indicator, Latvia appears to have a more serious rural access or digital divide problem. As more large cities are added to the capital, teledensity in the rest of the country is likely to fall dramatically, widening the urban-rural gap in access. It is suggested that a thorough study be undertaken to determine rural teledensity in Lithuania.

Table A4.5: Telephone Access in the Capital City and the Rest of the Country, 2000

| | Largest city ^a | | | Teledensity in rest of country (fixed lines per 100 people) ^b | Teledensity in entire country (fixed lines per 100 people) |
|------------------|---------------------------|--------------------------|--|--|--|
| | Population as % of total | Telephones as % of total | Teledensity (fixed lines per 100 people) | | |
| Lithuania | 15.8 | 21.0 | 42.7 | 30.7 | 32.2 |
| Latvia | 32.5 | 56.5 | 52.6 | 19.6 | 30.3 |
| Estonia | 36.4 | 42.3 | 42.2 | 32.9 | 36.3 |

a. Vilnius in Lithuania, Riga in Latvia, and Tallinn in Estonia.

b. Calculated by subtracting the absolute number of fixed lines in the largest city (*Y*) from the total number of fixed lines in the country (*X*) and then calculating the residual teledensity (*X* minus *Y* divided by total population minus population in the largest city, expressed per 100 people).

Source: International Telecommunication Union, *World Telecommunications Development Report 2002*.

16. The mobile sector has been particularly active in the Baltic states, making a substantial contribution to access in a comparatively short time, particularly in Estonia (table A4.6). In many EU member states total teledensity (fixed and mobile) exceeds 100 (per 100 people)—in 2001, for example, total teledensity in Finland was 132, in the United Kingdom 136, and in Sweden 151. But for Lithuania the question must be posed whether subscribers to mobile networks are also subscribers to the fixed network, which would imply lower average access and a greater digital divide (in terms of the total population having access to telephony) than the data suggest. Mobile networks can provide Internet access, but this is not yet widely available at affordable prices. Thus the fixed network has a role to play with respect to the Internet.

Table A4.6: Fixed, Mobile, and Total Telephone Penetration, 2001

| | Mobile teledensity (per 100 people) | Mobile phone subscribers as % of total | Fixed teledensity (per 100 people) | Total teledensity (per 100 people) |
|------------------|-------------------------------------|--|------------------------------------|------------------------------------|
| Lithuania | 25.3 | 47.5 | 31.2 | 56.1 |
| Latvia | 27.9 | 44.7 | 30.8 | 58.8 |
| Estonia | 45.5 | 56.4 | 35.2 | 80.8 |

Source: International Telecommunication Union, *World Telecommunications Development Report 2002*.

17. On closer examination two opposing trends become apparent. Between 2000 and 2001 the number of fixed lines declined and the number of mobile customers increased in all three Baltic states (table A4.7). But the changes were most dramatic in Lithuania, where the growth in mobile customers coincided with the launch of Tele-2, the third mobile operator.

Table A4.7: Network Growth, 2000-01
(thousands)

| | Fixed lines added | New mobile customers |
|------------------|-------------------|----------------------|
| Lithuania | -36.0 | +408.0 |
| Latvia | -9.9 | +255.6 |
| Estonia | -19.3 | +94.2 |

Source: International Telecommunication Union, *World Telecommunications Development Report 2002*.

18. These changes could mean that customers are substituting mobile for fixed services, that businesses are rationalizing their communications requirements, or that some customers are disconnecting their fixed telephones in response to tariff rebalancing. There would be a particular concern if the number of rural customers is declining.

19. All these trends manifest themselves in the economic performance of the telecommunications sector. The data in table A4.8 are indicative of the performance of the sector, though they are based largely on the turnover of the incumbent and do not reflect the vibrancy of the mobile sector.

Table A4.8: Telecommunications Revenues, 2000

| | Total (US\$ millions) | Per line (US\$) | As % of GDP 1999 |
|------------------|--------------------------|--------------------|---------------------|
| Lithuania | 259.8 | 219 | 2.3 |
| Latvia | 223.8 | 305 | 3.5 |
| Estonia | 228.9 | 553 | 5.2 |

Note: The data are for the incumbent's revenue from fixed line services.

Source: International Telecommunication Union, *World Telecommunications Development Report 2002*.

20. As the largest of the Baltic states by population, Lithuania generates the largest telecommunications revenues. But the revenues per line and as a share of GDP are the lowest of the three states. This raises a concern about the ability of the sector to generate sufficient finance to fund universal service obligations. This issue is discussed below.

Policy Issues and Proposals

Telecommunications sector regulatory capacity

21. *Issue.* Private investors place high value on a predictable, effective, and independent regulatory environment, and investments in building a credible, effective regulatory authority provide benefits stretching over the long term. Lithuania's Communications Regulatory Authority (RRT) was established in the spring of 2001. Like all the new regulatory authorities in the region, RRT is at an embryonic stage with little experience with a fully competitive market. Recently the EU adopted a new *acquis communautaire* that has not yet been extensively applied.

22. RRT faces several important challenges: adapting to the shift in its role from a largely technical regulator to more of an economic regulator, acquiring the appropriate skills for economic regulation, drafting the secondary legislation required of the new *acquis communautaire*, and implementing the new *acquis communautaire* effectively and in a relatively short period.

23. *Policy proposal.* The extent to which RRT can become an effective regulator depends on the new telecommunications law, the duties assigned to it and other agencies, and the powers provided to it by the law. Its effectiveness will also be determined by its staffing levels, the skills of its staff, and its ability to retain qualified staff. Like many other regulatory agencies in the region, RRT has a well-recognized need for technical assistance with capacity building and drafting of secondary legislation.

Transposition of the acquis communautaire

24. The main proposal in this section relates to universal access. Achieving the proposed universal access strategy requires addressing the issues of universal service (the long-term policy goal), local loop unbundling, licensing, and interconnection in the regulatory framework.

A. Universal service

25. *Issue.* Universal service generally involves a minimum set of telecommunications services of defined quality, which are provided at an affordable price to all telecommunications service users irrespective of geographical location. There is no particular problem in achieving this objective in most EU member states, where teledensity is high. But it is a serious challenge in Lithuania, where national teledensity is about 30 fixed lines per 100 people. Two forms of "access gap" can be identified. First, the "market gap"—the ability of the market when allowed to perform to supply access on a commercial basis—where private investment has a key role to play. Second, the "pure access gap"—customers who cannot be supplied by the market for reasons of location or affordability—where innovative policy has a role to play. The market in Lithuania was liberalized in January 2003 and will start to make its contribution to improving access to commercial customers. But a "pure access gap" will persist.

26. One mechanism that has been used to fill the gap is a universal service fund to which telecommunications service providers contribute around 1-5 percent of turnover and from which money is distributed to the entity with the universal service obligation. If we assume that total sector turnover is US\$500 million (based on total turnover for the incumbent of around US\$260 million in 2000; see table A4.8), a 1 percent levy on the sector would yield US\$5 million, and a 5 percent levy US\$25 million. These sums are insufficient to significantly improve the teledensity of Lithuania. In 2000 Lietuvos Telekomas invested nearly US\$130 million, equivalent to almost 50 percent of its revenues for the year.

27. If there are insufficient funds in the sector, finance must be found from other sources. The state budget is one possible source, but debt management needs and competing policy objectives may mean that extending access will not be a priority for government expenditure.

28. A significant share of Lithuanians lack access to communications networks mostly because they cannot afford it. This restricted access represents a significant obstacle to the development of a knowledge economy.

29. *Policy proposal 1.* The Government should consider pursuing a strategy of universal access supported by competitive auctions for any required subsidies. Two broad policies can be used to address the pure access gap: universal service and universal access policies. Both provide for a defined basket and quality of services at affordable prices. They differ in the degree of availability of these services. Universal service policies call for service to be provided to all who request it—a telephone in every home. Universal access policies facilitate the public availability of services—a public access point or telecenter in every community. The two policies can be characterized as emphasizing individual access or shared access. Both close the pure access gap, but at different costs. Providing universal service is generally much costlier than providing universal access. Normally, the provider of either service may be eligible for compensation depending on the financial loss incurred in closing the access gap. Both policy options must address the measurement of the loss and the means of compensation. The policy can be implemented by regulatory means or market processes.

30. *Regulatory option.* The EU electronic communications regulatory package allows the designation of a universal service or access provider, which is then obliged to provide the required level of service. Lietuvos Telekomas is most likely to be obliged to provide universal service (overlooking any contractual constraints), and compensation for losses will be paid by telecommunications service providers (for example, the mobile operators), not by the Government, according to article 23.3 of the new telecommunications law (5 July 2002). This could be done through a universal service fund, for example.

31. *Market process option.* Under the market process option the licensing authority specifies a defined level of service for a defined geographic territory (ranging from a municipality to the entire country) where there is a pure access gap (box A4.1). Recognizing that these concessions are not financially viable, the Communications Regulatory Authority (CRA) and relevant public institutions (for example, community-based organizations) can issue invitations to bid for one-time subsidies. The bidder requiring the lowest subsidy would then be obliged to provide the

defined level of service over a specified period (for example, 10 years). Appropriately structured, such bidding can attract substantial private investment, minimize the subsidy, and lead to a higher level of service than the basic obligation. The required subsidy is the amount just sufficient to make the telecenter commercially viable—it is not a 100 percent subsidy.

32. *Choice of option.* For Lithuania the regulatory option is more problematic and controversial, especially if it chooses a policy of obligating Lithuanian Telecom to provide universal services with compensation from the mobile operators, with the cost passed on to their customers.

33. A universal access policy is therefore proposed, pursued through market processes with particular attention to the possibility of municipal- or community-based provision of universal access. Within a targeted territory, bids can be invited for one-time subsidies for providing a certain number of public access points (for communications including Internet). The disbursement of the one-time subsidy should be linked to performance criteria relating to the establishment of the public access points. Bidders should be allowed to make their own technological choices. Bidders may find that additional commercially attractive individual customers may be reached in the territory for a small incremental cost once the public access points are in place. Because bidders will take account of these commercial opportunities when calculating the required subsidy, the subsidy will be minimized. Such an approach would be particularly attractive in providing local solutions to the access gap before setting more ambitious targets.

Box A4.1: The “Smart Subsidy” Approach to Universal Access

| |
|--|
| 1. Concept |
| <ul style="list-style-type: none">• Aims to mobilize private entrepreneurship and investment to supply services.• Focuses on providing public access to computers, the Internet, and other ICT services through telecenters (or cybercafes) in rural and low-income urban areas on a commercial basis by charging fees for services.• Provides a wider range of services and ICT than available on an individual basis at home. |
| <ul style="list-style-type: none">• Allows public or quasi-public agencies to become important commercial clients or partners in the telecenter.• Encourages local entrepreneurs to manage and have a stake in the telecenter as well as partnerships with bigger industry players.• Recognizes that in certain circumstances a telecenter providing universal access may not be commercially viable and that a subsidy may be required for part of the start-up and investment costs. |
| 2. Allocating subsidies |
| <ul style="list-style-type: none">• The licensing authority defines a level of service for a defined geographic territory for a defined period (say, 10 years) and issues an invitation to bid for a one-time subsidy.• Bidders are allowed to make their own technological choices.• Bidders calculate their required subsidy on the basis of expected income streams from fees, capital, and operational expenditure.• Bidders may find additional commercially attractive individual customers in the territory who may be reached at a small incremental cost once the public access points are in place. Bidders will take account of these extra commercial opportunities when calculating the required subsidy.• The required subsidy is the amount just sufficient to make the telecenter commercially viable—<i>it is not a 100 percent subsidy</i>.• The bidder requiring the lowest subsidy is declared the winner and is obliged to provide the defined level of service over a specified period on a commercial basis.• The disbursement of the one-time subsidy is linked to performance criteria relating to the establishment of the public access points.• The bidding ensures that the subsidy is minimized and generates substantial private investment. |

34. *Policy proposal 2* The Government should intensify its cooperation with the private sector, municipalities, NGOs, community organizations, and educators to extend affordable telecommunications access and Internet services. A local solution could be implemented through “community-based” service operators or providers, established by local authorities, NGOs, or the business community and local banks. For example, local communities, entrepreneurs, and authorities might join forces to establish a local telecommunications operator to bridge the access gap in rural areas. These local operators or providers could then bid on subsidies in competition with other providers, as described above under policy proposal 1. Such initiatives could be supported by national or local governments during pilot applications to test their viability and sustainability. If the intention is for the community-based operator to compete for subsidies with other operators, it is important not to provide it with other subsidies that would distort competition. Local governments and communities should therefore expect to recover their contributions and earn a return in the long run. Three considerations are crucial for the successful implementation of community-based service providers:

- *The financing model.* In this case a mixed financing model might combine contributions from local stakeholders (the public sector, businesses, and society) with funding (grants or loans) from the national government or international donors.
- *The business model.* The business model raises issues relating to the operational sustainability of a community-based operator. The business model must carefully forecast how operations will be carried out, what revenues will be generated, and what operational costs will be faced. By reducing costs and relying on an external subsidy rather than cross-subsidies, the community- and market-based universal access model allows a more balanced tariff-cost ratio that does not discourage use of telephone and Internet services for business purposes. To be successful, the business model needs to be based on clear, fair, and enforced regulations for interconnection.
- *The technical solutions.* In principle, there are low-cost technical solutions available (radio links, server connections allowing voice and data services), but the technology must have a proven ability to provide local communities with a cost-effective network that can provide telephony, Internet, and even cable television.

B. Local loop unbundling

35. *Issue.* Unbundled access to the local loop is provided for by EU Directive 2002/19/EC (the “Access” Directive). A question that needs to be addressed is whether unbundling provides sufficient financial incentives to the entity designated to unbundle its local loop. The tariffs for local loop unbundling in the EU are “cost-oriented including a reasonable return on investment.” When the designated local loop operator considers expanding its local loop, it will calculate the combined financial returns from the access charge paid by the customer and the usage charges for service paid by the customer. If the local loop is unbundled, the operator will regard the combined financial return as “a reasonable return on investment.” But the entity requesting the unbundling will regard only a figure related to the access charge paid by the customer as a reasonable price. Where the charge for local loop unbundling is less than the combined return, it

is conceivable that the designated operator will not undertake the investment to expand the local loop.

36. *Policy proposal.* The application of the unbundled local loop concept in Lithuania should be considered in the context of the policy objective of expanding access and universal service for the next two or three years.

C. Licensing

37. *Issue.* The application of the “authorization” concept of the *acquis* loosens the link between a license and a territory; while licenses are normally awarded for a distinct geographic area, in the authorization process the entity chooses its own territory and might choose not to serve “universal service customers,” perceived as unprofitable. Under the new *acquis* authorizations only entities benefiting from significant market power or scarce resources (such as radio spectrum) can have special conditions (for example, geographic coverage) imposed on them. In Lithuania there is no shortage of numbers in the national numbering plan. Consequently, the only scarce resource is radio spectrum. This implies that only Lietuvos Telekomas (presumably having significant market power) and the three mobile operators will have specific conditions imposed on them. CRA needs to develop an innovative approach to universal service. The first step would be to locate the “unphoned” and to initiate a universal access strategy.

38. *Policy proposal.* The regulatory challenge in Lithuania will be to provide sufficient incentives to attract suppliers of telephone and Internet services to those currently unserved. One course of action would be to seek ways to allow community-based service provision and partnerships among communities and other suppliers. These should be supported by technical assistance (to deal with the technological aspects) and assistance in developing sustainable business plans. RRT should undertake a study of the “unphoned” and issue licenses for the provision of universal access, with the licenses tied to specific geographic locations and auctions for subsidies.

D. Interconnection

39. *Issue.* The interconnection of networks (of which there are many in Lithuania) is one of the most important factors in ensuring the viability of competition in the sector. It is also an area characterized by frequent disputes. Interconnection involves commercial, technical, and operational arrangements. The disputes arise largely over the commercial aspect—the fee that operators are to pay one another for the termination or carriage of messages. There is a functioning interconnection market in Lithuania that will need to be developed through the entry of new players.

40. *Policy proposal.* To ensure that the market can fill the “market gap” and that the universal access approach can fill the “pure access gap,” particular attention needs to be paid to the resolution of interconnection issues. It is proposed that CRA provide interim solutions (with “netting out” taking place when agreement is reached), that international benchmarks be used

where possible to guide the determination of interconnection fees, and that particular consideration be given to interconnection fees related to the Internet.

Policies and institutions for an information society

41. *Issue.* Much like the institutional situation for innovation policies in Lithuania, dispersion of institutional responsibilities constrains effective government leadership in policy formulation, planning, coordination, monitoring, and evaluation for activities relating to an information society.

42. Four public sector institutions share responsibility for information society strategy, policy formulation, and implementation. Responsibility for implementation, particularly of e-government initiatives, rests with individual ministries. None of these institutions has the authority to coordinate, implement, and monitor policy implementation.

- The *Committee of Information Society* leads the legislative and regulatory work of the Seimas (Parliament) that relates to the information society. This parliamentary committee prepares draft laws and other legal acts and holds hearings with relevant stakeholders.
- The *Council of Knowledge Society* advises the president of Lithuania on matters pertaining to the information society.
- The *Information Society Development Commission* is chaired by the prime minister and is composed of ministers and advisers, including from the private sector. This consultative and advisory commission aims to coordinate key ministries associated with the information society.
- The *Information Society Development Committee*, under the Ministry of the Interior and Public Administration and the Ministry of Transport and Communications, plans and coordinates initiatives for the information society at the level of implementation. This committee has a permanent staff with significant capacity but lacks executive powers and a clear mandate to coordinate and monitor policy implementation.

43. Given these institutional arrangements, strategies and action plans for developing an information society have remained largely at the design stage. Experience in countries that are successfully developing an information society, such as Ireland and Singapore, shows that consolidating policy and implementation authority and technical capacity increases the effectiveness of policy actions.

Box A4.2: Building an Information Society in EU Candidate Countries through e-Europe +

The European Commission has launched the e-Europe 2002 Action Plan, aimed at making Europe "the most competitive and dynamic knowledge-based economy in the world."

The e-Europe 2002 Action Plan identifies three main priority areas on which activities should focus in paving the way to an information society in EU member countries:

- A cheaper, faster, more secure Internet.
- Investing in people and skills.
- Stimulating use of the Internet

A parallel initiative has been launched to build an information society in the EU candidate countries. The e-Europe + Action Plan—prepared by and for the EU candidate countries with the support of the European Commission—mirrors the actions and priorities identified by e-Europe 2002. The time frame for the EU candidate countries participating in e-Europe + is 2003, the same as for e-Europe, despite the different point of departure.

In drafting the action plan, the EU candidate countries agreed to accelerate actions aimed at putting in place the basic building blocks for an information society, improving the provision of affordable communication services for all, and transposing and implementing the *acquis communautaire* relevant to an information society.

The e-Europe + Action Plan takes into account the structural differences between EU member states and candidate countries

Source: http://europa.eu.int/information_society/topics/international/regulatory/europeplus/index_en.htm.

44. *Policy proposal.* Lithuania should consider consolidating in a single ministry the strategy, policy, and implementation monitoring functions now with the Ministry of Transport and Communications, the Ministry of Interior and Public Administration, the Information Society Development Commission, the Information Society Development Committee, and other institutions. This new Ministry for the Information Society (a precursor of which existed until 1997) would be responsible for establishing priorities for the development of an information society in Lithuania; formulating policy; planning actions; coordinating activities; and carrying out budgeting, financial management, and procurement. While line ministries would continue to be responsible for the implementation of programs and activities associated with the Government's information society strategy, the new Ministry for the Information Society would be empowered to coordinate, monitor, and evaluate implementation. The new ministry would also work to build a common understanding and consensus on the policies for an information society, enhance partnerships between government and the business community, and increase awareness and visibility of information society issues. The ministry would also coordinate closely with the proposed Lithuania Technology Agency. The staff and functions of the Information Society Development Commission would be integrated into the proposed ministry. While different countries in Europe have taken different approaches, this model follows the Slovenian approach (boxes A4.3 and A4.4).

Box A4.3: Ireland—Public Sector Institutions at the Heart of the Information Society

Ireland established an overarching agency, the Information Society Commission (<http://www.isc.ie>), to shape and manage the strategic framework for the Irish information society and to coordinate e-development activities of different government agencies and other ICT actors in the country. An advisory body for the prime minister, the commission includes representatives of the private and public sectors, relevant government departments, and social partners throughout the country. The commission's functions include:

- Monitoring the implementation of the major activities by relevant government departments and other key actors.
- Driving awareness campaigns targeting the enterprise sector and the general public.
- Establishing and monitoring the key benchmarks for the development of an information society in Ireland.
- Encouraging and supporting local and regional information society initiatives.
- Identifying (and overseeing the establishment of) flagship projects to demonstrate the benefits of the information society and win support for an Irish information society.
- Establishing advisory groups to further study potential information society benefits and actions required in individual sectors of the economy.

Box A4.4: Slovenia—a Ministry for Information Society

The Slovenian Ministry for Information Society (<http://www2.gov.si/mid/mideng.nsf>) was established in January 2001. Its responsibilities include issues related to innovation, the informatics and information systems, development of information technology, promotion of the information society and electronic commerce, and the development of telecommunications links and systems.

Because it is a ministry, this institution has both policymaking and policy execution powers and a budget to execute policies and programs.

The ministry's main interventions in its first years of operation have been targeted at:

- Addressing the digital divide in the country.
- Promoting the knowledge economy and e-business in both the private and the public sector.
- Promoting education and training for the information society.
- Sustaining the ICT sector in Slovenia with an emphasis on employment.
- Monitoring and implementing regulations in the area of infrastructure and e-business.
- Harmonizing Slovenia's legislation with the EU standards.
- Evaluating and promoting sector-specific legislation.

45. *Issue.* The absence of a clear, coordinated institutional framework for an information society in Lithuania hinders the implementation of strategies and action plans for addressing e-Europe + and other initiatives. The main policy document on the development of an information

society in Lithuania is the “Lithuanian Information Society Development Strategy,” prepared in May 2000 by the Department of Information and Informatics of the Ministry of Public Administration Reforms and Local Authorities. The main goals of this three-year strategy are to use the opportunities offered by ICT to support information management with the aim of improving people’s quality of life, learning, and working and leisure conditions; to create ICT infrastructure in compliance with EU standards; and to create good conditions for Lithuanian citizens for learning and using the potential of modern ICT. The Information Society Development Committee has developed detailed action plans to complement the strategy, but implementation has been pending.

46. *Policy proposal.* Lithuania should adopt a detailed “consensus” strategy and action plan agreed on with the main stakeholders in policy and implementation. This information society strategy should go beyond a political vision and be backed by detailed action plans.

**Box A4.5: Singapore—Clear Action Plans to Pave the Way
for an Information Society and Knowledge Economy**

Singapore’s lack of natural resources encouraged its government to invest heavily to turn the country into “the Intelligent Island.” In doing so, the government paid much attention to infrastructure, skills, and ICT adoption across government, society, and business.

Singapore’s information technology initiatives evolved in three phases, each outlined in national action plans that clearly identified targets, policies, resources, and actions.

The first phase, in the mid-1980s, launched the establishment of the National Computer Board to manage and implement the Civil Service Computerization Program, aimed at digitizing the public administration and supporting skills development for civil servants.

The second phase, guided by a National Information Technology Plan, was aimed at supporting the creation of local ICT industry and enhancing business productivity through ICT applications.

The third phase, based on the IT2000 master plan, focused on applying ICT to enhance national competitiveness and improve the quality of life of Singaporeans.

Singapore provides a good example of the development of targeted and precise action plans after a careful evaluation of local needs and potential. The action plans were formulated after an analysis of the country’s 11 major economic sectors and through a consultative process involving more than 200 senior executives from both the public and the private sector.

Source: <http://choo.fis.utoronto.ca/FIS/ResPub/IT2000.html>.

Knowledge management, e-government, and e-business

47. Public and private sector knowledge management, supported by ICT, is an important element of a knowledge economy. Knowledge management involves defining and managing:

- Strategies for identifying, creating, and using information to support government and private sector activities.
- The information life cycle—documenting, organizing, protecting, eliminating, retaining, and preserving.
- Information integration, integrity, access, and privacy.
- Ownership, control, accountability, and responsibility.

48. For an institution or company to manage knowledge well, there needs to be a systematic alignment of overall management, information management policies and processes, mindset and culture, organizational structure, skilled labor, technology, and budgets.

49. E-government refers to the use by government agencies of information technologies—such as wide area networks, the Internet, and mobile computing—that have the ability to transform the government’s relations with citizens, businesses, and other arms of government. E-business refers to the use of ICT to change businesses’ relations with their customers, suppliers, and competitors.

50. *Issues.* Lithuania’s public sector faces several challenges in implementing its knowledge management and e-government strategy. By far the most pressing concern is the need for credible and organized leadership to set priorities, develop action programs, monitor the implementation of these programs, and tackle issues of culture for knowledge sharing. Several stakeholders have emerged in the planning phase, and their roles are unclear and overlapping.

51. The challenge of integrating information management systems and managing knowledge across government institutions and sectors (for example, education, innovation, and R&D) has not received sufficient attention. Public institutions often have no clear and documented workflow process for their business activities, nor do they have a solid document management process. Within government institutions, scattered and multiple databases (for example, state registries) flourish with no integration or centralization, resulting in poor data quality and the duplication of efforts and information. Private sector knowledge management is also poorly developed (though there are a few exceptions, such as in the banking sector).

52. Government agencies have carried out a modest number of projects defined as e-government, but most simply end up automating existing work processes. These projects lack planning for business process reengineering or change management, required to create the efficiencies associated with e-government. The Government should also consider addressing the following obstacles:

- E-government initiatives are not aligned with public administrative reform projects.
- Local and national government agencies participate only sporadically in e-government planning. This has led to confusion; agencies are not informed of government strategies, and initiatives undertaken in different agencies are sometimes not known to or understood by higher-level bodies.

- Many different agencies are competing for ICT funding from international sources. The lack of overall coordination and oversight for ICT spending, standards, and projects (including procurement) has resulted in duplicative spending and redundant efforts and has deterred data sharing and integration between agencies.

53. Although an e-government concept paper exists, competition for authority and responsibility by different players has resulted in disagreement over the planning and approach for e-government, paralyzing any real efforts toward implementation.

Policy proposals.

- Assign responsibilities for knowledge management and e-government policy, strategy, and monitoring to the proposed Ministry for the Information Society (see above).
- Develop a knowledge management strategy and action plan to accelerate the integration of information systems within and among ministries and to implement knowledge management systems within public institutions, systems credibly endorsed at the highest political levels.
- Encourage knowledge sharing in organizations and provide the incentives and environment for employees to do so. While this is most relevant for the public administration, it also applies to many businesses.

54. *Issue.* There is a shortage of skilled technical and managerial staff to effectively undertake knowledge management tasks. The education system does not produce the practical and theoretical skills needed. And government institutions have difficulty retaining highly skilled technical staff because of low salaries.

55. *Policy proposal.* Efforts should be made to create links between the public administration and the education system to provide formal and informal training on knowledge management, and to develop curricula for training in knowledge management.

Box A4.6: Popular Government Web Sites in Lithuania

Where content is useful and relevant, Internet channels have been very popular in Lithuania. The Parliament's Web site (<http://rc.lrs.lt/>), which hosts a wealth of content in Lithuanian, French, Russian, and English, attracts about 390,000 users a month. The Parliament attributes this traffic to the frequent use of a legal database, accessible free of charge. The Legal Information System contains about 120,000 documents, including all laws published in the official gazette since 1999, documents of the Baltic Assembly, international conventions and bilateral or multilateral agreements, texts of draft legal acts, and translations of documents in English and Russian. Content is furnished daily, with about 70 new documents a day and 1,500 a month.

Another frequently searched database is the EU document database ESIS (<http://europa.eu.int/ISPO/esis/default.htm>), which provides reports on Lithuania's progress toward EU accession, its EU accession program, and EU legal acts. ESIS contains more than 11,000 documents, half in Lithuanian, and receives about 7,000 searches a month. The Web site also provides content on parliamentary sessions, members of Parliament, each parliamentary political group, and the work of each standing commission.

The Ministry of Justice's Web site (<http://www.min.tm.lt/english/>) has 6,700 regular customers who use Infolex, an online legal database containing draft laws. The site allows public comment, a feature widely used this year because of the new civil code, which generated 36,000 visits and requests for information. Infolex is used mainly by the legal community, which also discusses draft laws and provides legal consultations online. The database is accessible for a fee of 20-80 LTL.

Box A4.7: E-Development in Estonia

The remarkable success of e-government programs in Estonia is attributed largely to a political commitment at the highest level to making the country's ICT development integral to the growth of its economy and the achievement of its development goals. In an effort to build broad-based connectivity and make access to ICT a basic right, Estonia embarked on an ambitious e-readiness program to promote the reform and growth of its ICT sector, which has been key to the success of Estonia's e-government strategy. Leading the effort is the Ministry of Transport and Communications, which is responsible for ICT development. Its mandate includes:

- Working closely with the private sector on initiatives for developing ICT infrastructure.
- Defining policies, standards, and procedures.
- Managing ICT development projects.
- Managing ICT planning and development for the public sector.
- Providing guidance and policy assistance to ICT working groups of ministries and other government agencies involved in information technology.

To further strengthen its ICT development, Estonia demonopolized its telecommunications sector and instituted a legal and regulatory framework for telecommunications that is consistent with EU principles. Estonia's investment in ICT was followed by broad use of ICT applications in public administration, banking, education, health, and transport. E-government applications in Estonia are diverse. Cabinet ministers communicate, prepare legislation, and vote online over a portal. All government documents and both live broadcasts and full-text transcripts of parliamentary sessions are posted instantly on the government's main Web site. The portal allows citizens, businesses, and NGOs to submit proposals to the government and comment on government proposals, increasing public access and voice in decisionmaking. The ETax Board application allows citizens to file, view, and correct their returns in real time. All government business is conducted through a secure, Web-based electronic information system.

Source: <http://www.riik.ee/>.

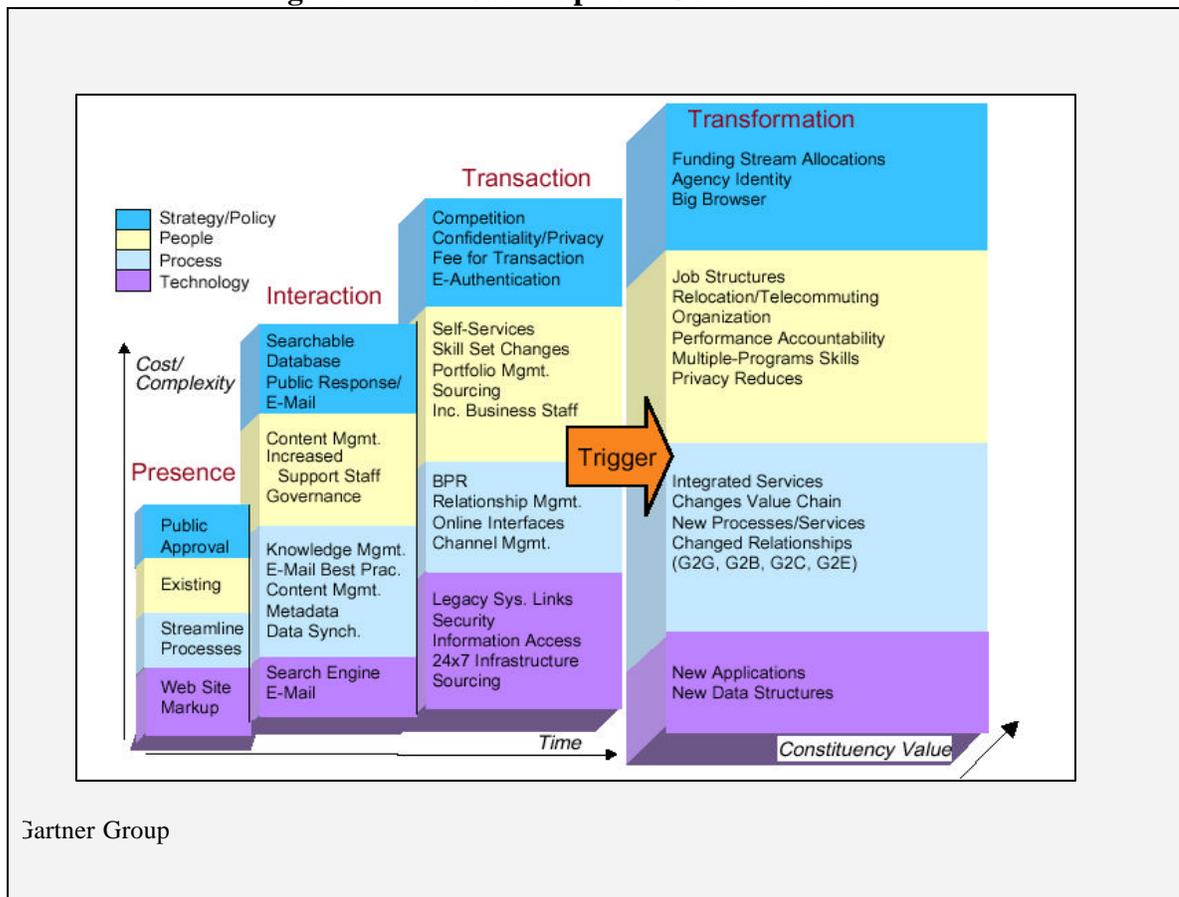
56. E-government typically occurs in a number of stages:

- *Presence.* Governments begin publishing information online, starting with rules and regulations, documents, and downloadable forms. This allows citizens and businesses to easily access government information without having to travel to government offices, stand in long lines, or pay bribes. By helping governments tackle the problem of inefficient bureaucracy and corruption, this capability can significantly alter citizen and government relations.
- *Interaction.* Two-way communications develop, beginning with simple functions such as email contact information for government officials or feedback forms that allow citizens to comment on legislation or policy. This can also involve creating online forums allowing new channels of citizen-government interaction and increased political participation.

- *Transaction.* Web sites provide direct links to government services—such as land registration or the renewal of identification cards—allowing citizens to access the services at any time, at home or through kiosks in public places.
- *Transformation.* Portals and Web sites allow citizens to conduct transactions online, such as filing taxes, paying fines, and submitting forms and declarations. These services can result in significant cost savings for public agencies, greater public accountability, and better service delivery for citizens. Back-end processes are streamlined to allow businesses, citizens, and government to access government services and information and to interact with government through a “one-stop shop” without having to visit several government agencies or navigate through a maze of Web sites.

57. Lithuania is between the first phase—presence—and the second—interaction (figure A4.4). The challenge for Lithuania is to move from these phases toward the transaction phase. For a number of reasons, the Lithuanian government has been unable to move forward.

Figure A4.4: Road Map to E-Government



58. *Issue.* The absence of an adequate legal framework for electronic transactions hampers the provision of both e-government and e-business services in Lithuania. Despite initial steps toward harmonizing domestic legislation with international standards for electronic transactions, Lithuania lags behind in passing relevant regulations.

59. A plausible regulatory framework must be in place to ensure that electronic transactions can take place effectively and securely. The legal environment for e-business should include legislation on e-signatures, e-commerce, e-documents, and data and information collection, sharing, and use, and provide solid ground for protecting consumers' rights.

60. In drafting and implementing relevant legislation, Lithuania is aligning with EU directives and standards to ensure consistency with the *acquis communautaire* in e-commerce. The Seimas passed an e-Signature Law in July 2001, but lack of supportive secondary legislation—relating mainly to the establishment of certification agencies—prevents the law from being fully implemented. A Law on Electronic Commerce is under preparation in the Seimas.

61. The Lithuanian government passed a law on legal protection of personal data in 1996 and has amended it in compliance with EU Directive 95/46/EC. The revised law on the Legal Protection of Personal Data came into force in January 2001. Moreover, in early 2001 the Seimas ratified the Convention of the Council of Europe for the Protection of Individuals with Regard to Automatic Processing of Personal Data.

62. *Policy proposal.* The legal framework should be fully aligned with international standards to ensure that digital transactions are possible (e-signature legislation) and fully protected (digital documents, e-commerce regulation). In this area Lithuania seems to have fulfilled only a few of the formal requirements, while more efforts need to be undertaken to ensure full implementation of the legislation governing the Internet and electronic transactions.

Box A4.8: Addressing the Digital Divide in Lithuania

Lithuania has 680 Internet users per 10,000 people, compared with 1,480 in Estonia, 720 in Latvia, and almost 4,000 in the European Union. Only 3.2 percent of households in Lithuania have an Internet connection, compared with 36 percent in the European Union. And surveys have found that a third of Lithuanians have no idea what the Internet is or what it can do for society. Thus they remain unaware of the many opportunities offered by ICT opportunities.

Large differences exist between residents of cities and rural areas. In 2001, 23 percent of citizens in Vilnius had a computer at home, compared with only 4 percent of the rural population. About 11 percent of the people in Vilnius had access to the Internet at home, while only 1.3 percent of the rural population did. User proficiency also varied: about 36 percent of people in Vilnius knew how to use the Internet, compared with only 8 percent of rural dwellers. For people in Kaunas, Klaipeda, Siauliai, Panevezys, and Alytus the figures are between those in Vilnius and rural areas. A key issue in rural areas is the cost of access.

The potential benefits of extending access and use of ICT to poor people and regions are large. These benefits include better information flows, better opportunities for job searches and job creation, and communication and networking (including with governments) that can enhance the democratic process, improve government services, and permit distance learning. Extending access and use of ICT is a challenge. But it is also a great opportunity to involve marginalized groups in the move toward a knowledge-based economy and to reduce social exclusion. A case can be made for properly designed subsidies to improve access to ICT, on grounds similar to those for subsidies for public education.

Experience has shown that successful efforts to extend access and use of ITC depend on government (including local government), leadership and funding, public-private partnerships, and strong NGOs and community organizations. Lithuania is well positioned in all these respects.

In April 2002 the private sector took the lead in launching a new digital program, Window to the Future, on a pilot basis. Funded by a consortium of four companies (Vilnius Bank, Hansa Bank, Omnitel, and Telekomas), the program aims to provide Internet centers to people in towns and villages. The program is not intended to compete with Internet cafes, but to offer free public Internet access points in public facilities.

In June 2002 the Information Society Development Committee, a special government department, announced a major new initiative to provide public Internet access points throughout the country. This initiative is now being pursued as a public-private partnership with the Window to the Future program (<http://www.ivpk.lt/en/>).

The Open Society Foundation (supported by the Soros Foundation) is developing a program for ICT awareness and development in rural areas, concentrating on small towns and rural villages. Its program sets out several key objectives: raising awareness about the need to extend use of ICT in local communities and the social opportunities it offers, developing an environment supporting the use of ICT, evaluating the readiness of districts in Lithuania for the pilot project "Digital Community," and initiating pilot projects in selected urban and rural districts aimed at overcoming the digital divide. The program emphasizes training and content development. The Open Society Foundation has a solid record and experience in community development work in many countries in Eastern Europe.

Municipal administrations in the six largest cities (Vilnius, Kaunas, Klaipeda, Panevezys, Siauliai, and Alytus) seem to be well aware of the digital divide and are keen to help. Each of these cities has fringe communities living at the periphery and residents facing digital divide problems. In smaller cities and in rural areas local governments have limited financial and administrative capacity. One way to tackle the problem there would be to ask the Association of Lithuanian Municipalities (ALAL) to devise a mobile outreach program with skilled users to visit each of the 64 municipalities smaller than the top six cities and consult with them on installing and maintaining public Internet access points in municipal buildings.

63. Many locations in Lithuania already have active community centers, multipurpose organizations that typically focus on solving urgent community problems such as alcoholism and child abuse. The centers usually depend on one or a few strongly motivated, salaried individuals. Without such individuals there is no viable community center. Connecting these community centers with one another and with the international community are about 20 NGO support centers, umbrella organizations supported by international donors. These support centers could play a useful role in helping communities design, pilot and implement community support projects .

64. The Citizens Advisory Union, a Lithuanian NGO, has begun sharing knowledge about government processes with citizens. The NGO has trained 200 people all over the country to provide information to citizens about laws and government services, especially in low-income communities. The group has received 4,000 visits from people inquiring about issues ranging from labor laws to pension information. With a free phone line provided by Lietuvos Telekomas, the group also conducts phone consultations. The group has produced a CD-ROM about different government laws and services and distributed the CD-ROM to its 10 bureaus, where volunteers use it to provide information to visitors and callers.

65. *Issue.* The scarcity of content in local language affects the demand for e-services (both e-government and e-business) and increases the gap between social groups—between the young and the elderly, and between high-income (and English speaking) and low-income groups.

66. *Policy proposal.* Support should be given (selectively) to initiatives for creating local content and converting local knowledge into digital content. There are opportunities for local companies and organizations to participate in EU programs aimed at creating local content, such as the e-Content Program.

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