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National Dependability Policy Environments

LUXEMBOURG

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Overview of the Country's Information Infrastructure

Although small, Luxembourg is an advanced ICT European country. Its labour force is well-educated and well-known for its efficiency and high productivity. With a literacy rate of 100 percent for its population members over the age of 15, and an abundance of multilingual workers, the country's labour pool is an important asset to employers. The highly-educated population has been essential to the development of Luxembourg's growing financial services industry.¹ Because of its central location, Luxembourg has a high number of multilingual citizens. Most of the population speak French and German, and a significant number are conversant in Dutch. English is not used often in business, except in the financial services industry.

Significant ICT computer hardware manufacturing operations do not exist in the country. Possible reasons for this lack of hardware production include limited workforce availability, the high cost of living, the small size of the domestic market, high capital requirements, and the economy's emphasis on financial services.

Software development in Luxembourg is primarily focused on developing proprietary systems for individual companies and customising commercial off-the-shelf (COTS) software. Most software work takes place in the financial services industry. Because of Luxembourg's limited available workforce and high operating costs, there are not ample opportunities for large-scale software development investments. The best opportunities would involve targeted software development for offshore banking, satellite, broadcast, and steel industries. Opportunities are particularly strong for software development for the offshore banking industry, as 60% of the world's transactions are handled through Luxembourg. Luxembourg's dominance in this area may be diluted in the future as harmonisation across the EU occurs, but – for now and for several years to come - developers could benefit from the concentrated knowledge base and ready market.

In terms of ICT penetration, awareness of and interest in the Internet have increased dramatically over the last several years. In 1995, almost 45% of Europeans had no concept of the Internet. That figure has now dwindled to 3%. Nua Internet Surveys estimate that Luxembourg has one of the highest levels of home internet penetration in Europe at 8.6% – as compared to Sweden, 18.5%, Finland, 9.5%, Germany 8.9%, and UK 5.3%.

Luxembourg has a state-of-the-art, highly developed, and completely automated phone system which is indicative of the important roles that telecommunications and international commerce play in the small country's economy. Given the country's per capita wealth and advanced development, it is not surprising that Luxembourg has the highest teledensity (telephone lines per 100 inhabitants) of all of Europe, reported in June 1999 at 72 percent.²

Domestic telephone services are provided by the nationwide cellular telephone system and buried cable.³ The government-run *Entreprise des Postes et Telecommunications* (EPT) provides fixed telephone, internet, and

¹ US Embassy Guide on Luxembourg: www.state.gov/www/about_state/business/com_guides/1999/europe/lumem99.html (visited on 21 March 2002)

² Communications International, London, June 1999.

³ CIA, The World Factbook (1999) – “Luxembourg”: www.odci.gov/cia/publications/factbook/lu.html

cellular telephone services through its cellular branch, LUXGSM. In May 1998, the government licensed 10 fixed-line operators and as of the time of writing their impact on the market was not yet clear, although some expect that the PPT will lose market share for its fixed line services as it did in the case of cellular services.

Societe Europeenne de Communication ("SEC"), an alternative European telecommunications company, operates Tele2 Luxembourg S.A. for international telephony services; Tango for mobile telecommunication services; 3C Communications for public pay telephones and public Internet services; and Transac for billing and transaction processing services.⁴

Luxembourg has a nationwide cellular telephone system. Cellular services are provided by LUXGSM, the cellular arm of the EPT and by a new competitor, Millicom's Tango brand. The cellular subscriber phone market in Luxembourg doubled between December 1997 and December 1998, at which point 126,000 people (30% of the country's population) were subscribers. Competition in this market began in May of 1998.⁵

In 1985, the Luxembourg government created a private satellite company called the SES (*Societe Europeenne des Satellites*) that granted franchises to private investors. The franchise owners operate the Astra satellite system, which provides telecommunication services throughout Europe via seven geostationary satellites. Using 138 transponders, the Astra satellites reach 43% of all European TV households. They transmit 99 analogue and 219 digital television channels and over 190 analogue and digital radio channels. An estimated 93% (70 million) of European TV households receiving television by satellite or cable receive at least one or more channels via the Astra system. The company commissioned an additional four satellites for deployment through the year 2000. In July 1998, SES introduced its initial IPO. The company's existing major stockholders are Deutsche Telekom and Luxembourg public institutions.⁶

SES also established the European Satellite Multimedia (ESMS) company to provide multimedia services by satellite. In December 1998, SES announced plans to launch Europe's first satellite system using the Ka-band to provide a satellite return path. Using new technology via the Ka-band (as opposed to Ku-band), the company will provide interactive broadband and "band-width on demand" multi-media services to enable the distribution of multimedia applications to multiple parties ("multicasting"). The initial market for these services will be business customers in Western Europe, with future plans to extend service to Eastern Europe, Russia, and the other states of the former Soviet Union.⁷

SES has created a joint venture with Intel to operate a service called Astra-Net, linking satellite broadcasting with personal computers. Businesses will be able to rent communications time on the satellite, allowing them to transmit large amounts of data at high speed to all their satellite dishes across Europe.

Notwithstanding these telephony successes, the country's Internet infrastructure is still limited. With 40 internet hosts per 1000 inhabitants in 1999, Luxembourg ranks in the middle of OECD countries in the number of internet hosts per capita.⁸ One major improvement in Luxembourg's infrastructure is the increased number of secure servers per million inhabitants. Luxembourg has exceeded 75 and stands

⁴ [Societe Europeenne de Communication S. A.](#): Press Release (29 October 1999)

⁵ See the Privatization and Deregulation Page for a summary of the impact of this change.

⁶ [New Media Markets](#) (25 June 1998 and 9 July 1998).

⁷ [New Media Markets](#), London, (December 1998).

⁸ www.oecd.org/dsti/sti/it/cm and www.isc.org (visited on 21 March 2002)

behind just four countries: the United States, Iceland, Australia, and New Zealand.⁹ In terms of secure Web servers for electronic commerce, Luxembourg ranks just behind the United States, Iceland, Australia, and Canada.¹⁰ A large number of internet service providers serve the Luxembourg business and personal markets. Many charge less than 25 EUROs per month.¹¹ At the same time, the use of ISDN lines is becoming much more widespread, largely because of a 1997 change in the Luxembourg PTT's pricing structure. They are replacing normal phone lines as the standard lines. Many suppliers are now offering ISDN single and dual channel connections.¹²

The use of e-commerce is growing in Luxembourg as it is in many of the European countries. With its high penetration of computer and internet users and its well-developed telecommunications infrastructure, Luxembourg has established cornerstones on which to build a robust e-commerce market. In fact, the OECD reports that Luxembourg is one of the "smaller member countries, along with Iceland and New Zealand, who are rapidly expanding their electronic commerce infrastructure." Because of the predominance of banking and investment fund management in Luxembourg's economy, it is not surprising that this industry is leading many of the developments in the e-commerce arena.

Main ICT Regulatory and Legal Developments

Luxembourg follows the principles of the European telecommunications legal framework. Nevertheless, it has also looked to the European Commission for additional funding to carry out advanced business and research projects.¹³

Luxembourg's economy is highly dependent on international trade and commerce. It owes much of its international status to its banking industry. The government of Luxembourg seeks to establish policies which will maintain and expand its business and power base.

Luxembourg has grown into a worldwide financial services centre because of its low level of governmental regulation and its tax exemptions. The government offers tax exemptions and investment incentives to attract new businesses, and gives preference to hi-tech ventures.¹⁴ Particular focus is directed towards software-related intellectual protection through their membership of the Universal Copyright Convention and the Patent Cooperation Treaty.¹⁵

In this ICT intensive context, Luxembourg has examined at the issue of cyber-crime. The Act of 15 July 1993 on financial crime and computer crime states that whoever fraudulently gains access to a system of data processing, shall be punished with imprisonment from two months until one year, or a fine from LF10,000 to LF250,000 or both. The suppression or modification of the data contained in the system, or

⁹ www.oecd.org/dsti/it/cm and www.netcraft.com (visited on 21 March 2002)

¹⁰ OECD from Netcraft Data. (visited on 21 March 2002)

¹¹ www.theblade.org/iap/europe/Luxembourg/index.html (visited on 21 March 2002)

¹² www.theblade.org/iap/europe/Luxembourg/index.html (visited on 21 March 2002)

¹³ Electronic Engineering Times (6December 1999).

¹⁴ Europe, Prime Minister of Luxembourg: Jean-Claude Juncker, March 1999, Luxembourg 1999 Country Commercial Guide, www.state.gov/www/about_state/business/com_guides/1999/euro/luxem99_06.html (visited on 21 March 2002)

¹⁵ International Software 99 Report, www.fenwick.com (visited on 21 March 2002)

the alteration of the function of the system, may lead to imprisonment from two to four years and given a fine from LF50,000 to LF500,000.¹⁶

Assessment of Phenomena Undermining Dependability

There is no public accessible data on cyber-crime in Luxembourg.

Industry and Other Non-Government Activities Related To Dependability

There are no systemic industry or non-government activities related to dependability in Luxembourg. An interesting case though is EuroSignCard. Created in July 1999, EuroSignCard S.A. has been assisting financial institutions in improving the security of their financial transactions. The objective is to eliminate the transfer of funds through unsecured and unsigned messages. EuroSignCard engineers, implements and maintains total security solutions based upon national Directive 1999/93. EuroSignCard combines key enabling technology of partners to create a total system solution for customers. Partnerships include: Identrus LLC, Baltimore Technologies, Entrust Technologies, Valicert, Entegriety Solutions and KyberPass. Other partnerships include Digital Signature Trust, NEXOR, Cyber-Security, and Novell. The focus of the firm is the roll-out of public key infrastructure (PKI) solutions.¹⁷

Public-Private Partnerships

The project Luxembourg Computer Emergency Response Team (LUX-CERT) is a joint initiative of the public *Centre de Recherche Public Henri Tudor* and the national research network Restena. LUX-CERT serves as a focal point of contact for reporting security violations and for disseminating security-related information and security advisories to the Internet community in Luxembourg. The objectives of LUX-CERT are to thwart cyber-attacks, to co-ordinate information exchange during incidents and to lower the potential damage from attacks. When connected sites are under attack, LUX-CERT reacts as quickly as possible, relaying information to and from the sites. It has the means to establish communication quickly with national experts in order to obtain their advice. If special software is needed to overcome a security problem, LUX-CERT may be able to provide it. When one member comes under attack, LUX-CERT notifies all other members of the attack so that they can take appropriate precautions. LUX-CERT gathers statistics on incidents in Luxembourg and distributes information on security-related topics. LUX-CERT provides several information services, such as the operation of an anonymous FTP Server containing security related documents and tools. In addition, it maintains closed contacts with CERT Teams in other countries.¹⁸

¹⁶ www.mossbyrett.of.no/info/legal.html (visited on 21 March 2002)

¹⁷ EuroSignCard: www.eurosigncard.lu (visited on 21 March 2002)

¹⁸ Luxembourg Computer Emergency Response Team: www.cert.lu (visited on 21 March 2002)