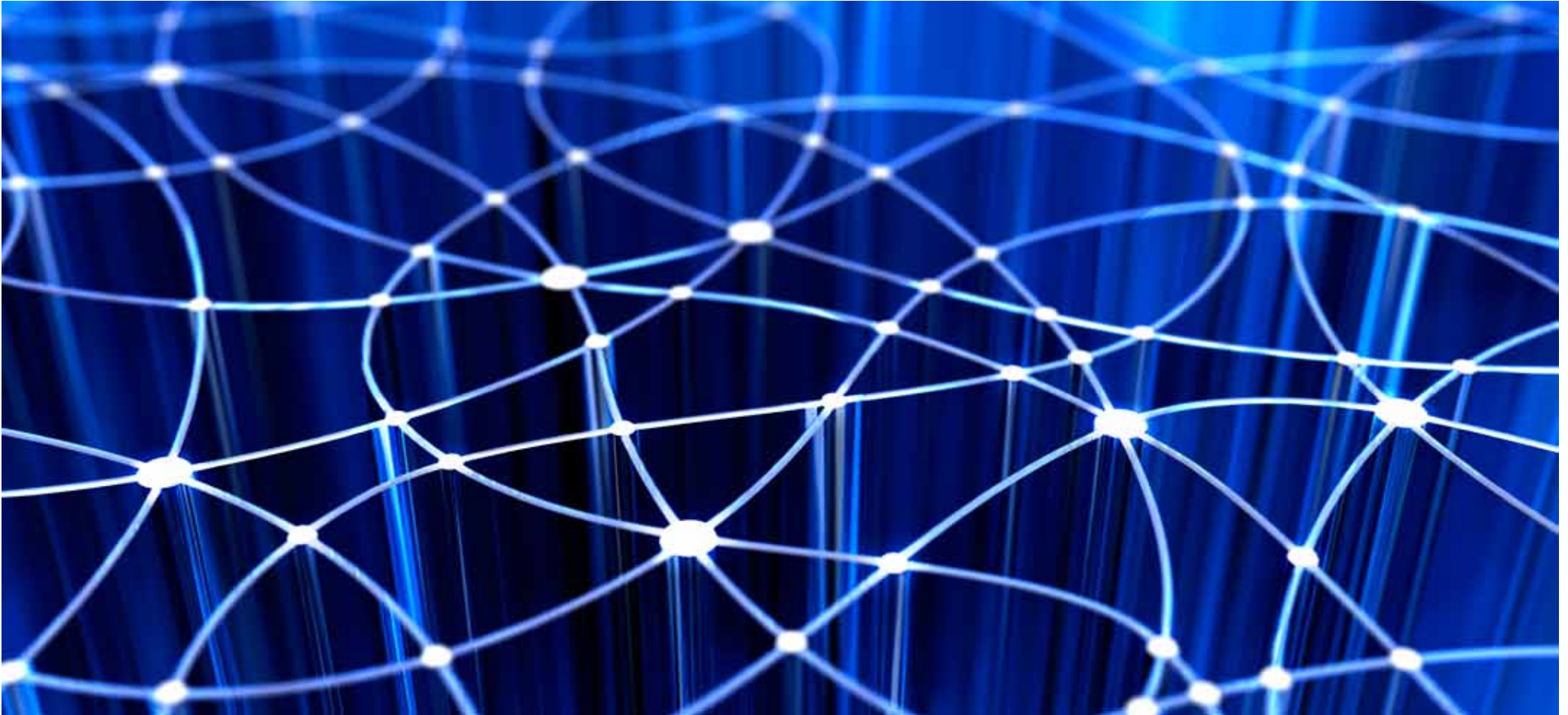


# Luxembourg: an e-hub for Europe

## Opportunities and actions on the horizon 2015





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# Executive summary

The explosive growth of digital technologies, processes and data in even just the first decade of the 21<sup>st</sup> Century is transforming the global economy. The impact of digital technology will be increasingly felt across all areas of the economy, transforming sectors such as retail, healthcare, media and financial services and driving major changes in consumer behaviour. Electronic services are an essential requirement for the expansion of business offers and the facilitation of key processes. This landscape represents a future in which Europe has a key role to play and Luxembourg, in turn, has the opportunity to have a central function in developing that future.

Luxembourg has ensured that it is in a strong position to compete in the new digital economy and offer real advantages to digital businesses through a number of initiatives over the past few years. Significant public investments in state-of-the-art data centre infrastructure and high-speed connectivity constitute key elements of the government's development policy. The creation of research capabilities at the University of Luxembourg that focus on some of the key issues that are driving the digital economy, such as information security, is also an example of the country's competitive edge in the digital space. These actions, which build on Luxembourg's favourable business environment and forward looking government policy, have helped drive the establishment of a number of ICT and digital companies in Luxembourg, such as Paypal, iTunes, eBay, Amazon or Skype, as well as start-ups and are generating further interest and momentum in Luxembourg's development in a new digital era.

In the context of this changing market, Luxembourg's ambition is to develop itself as a key hub for digital businesses and it therefore focuses on the new market opportunities to build and strengthen its competitiveness in the future. In response to this need, PwC Luxembourg has worked with major industry players<sup>1</sup> to analyse opportunities of the electronic services market and identify the factors that will help Luxembourg to reach its ambitions.

As a result of this initiative, five areas of opportunity have been identified and are covered in this document, together with a dedicated action plan for each of them:

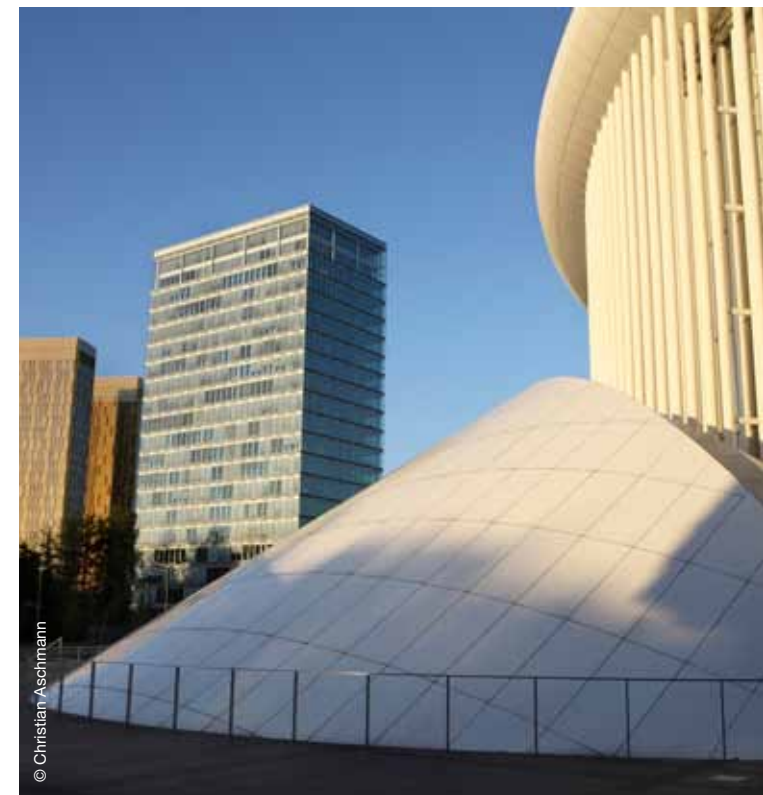
- Media and entertainment;
- Financial services;
- Energy and smart grid;
- Cloud computing;
- Digitised workflows.

1 ABBL, APSI, Association des PSF de support, EuroCloud, Fedil ICT, LU-CIX and PwC Luxembourg are the sponsors of this initiative.

These actions include:

- **Human capital** – promoting Luxembourg as a key location for ICT jobs and ensuring that education and the ICT marketplace are aligned through partnering and exchange with leading universities both at a regional and wider international level.
- **Infrastructure** – leading Europe in the roll-out of ultra-fast broadband; pioneering the development of data centre technology by creating a platform for testing and innovation; further increase the connectivity between Luxembourg and major international Internet hubs.
- **Creation of commercial laboratories** – build platforms for prototyping, developing and testing new technologies in a ‘real world’ environment, so that Luxembourg becomes a showcase for cutting-edge technologies and their commercial application.
- **Finance** – develop an intellectual property funds framework and foster a community of early-stage venture capital funds. Public procurement should back new technologies to accelerate their adoption and a finance guarantee mechanism introduced to help manage start-up risks.
- **Economics** – analyse the economic impact of digital business and e-services on Luxembourg’s economy and assess the need for a business case on authors’ rights.
- **Regulatory and tax framework** – adapt tax law to cover non-patented innovative technologies and upgrade the existing tax regime to foster R&D; consider direct tax incentives to compensate the loss of the current VAT regime and ensure a user-friendly VAT environment post 2015.
- **Governance and communication** – create a single and comprehensive umbrella ICT trade association to offer one-voice and embrace all industry participants to build an effective channel for communication; create a communication plan to raise the profile of Luxembourg’s value proposition.

This document highlights the main elements of Luxembourg’s e-services proposition. It aims to offer key decision makers and influencers in the public and private sectors food for thought about how to enhance the country’s offer by providing recommendations and action plans that can propel Luxembourg to become a key strategic location and a thriving ecosystem for electronic services.



© Christian Aschmann  
European quarter – Philharmonie concert hall

# Chapter I:

## Key business trends



More and more of us live in a world in which many of the things we do, experience and use are digital. The significant growth in digital services means that the amount of data and information that we routinely produce, use and share is growing at a staggering rate. That applies to businesses, governments and consumers.

For all businesses, these changes are profound. The use of predictive analytics to interrogate data with sophisticated algorithms to understand what consumers want is changing the way that businesses use data and information to communicate with their customers. Social networking – the power of the global crowd – is only beginning to show its potential to transform the way that individuals and businesses share information and interact around the globe. Digital media is shattering old business models, shifting control from producer to consumer and moving marketing strategies from mass campaigns to more customised and intimate relationships. Business services, driven by the need for global availability at all times, increasingly have to be hosted in ‘the cloud’ to ensure access to users wherever and whenever they are needed.

There are developments shaping today that will prove truly transformational, creating the new industries and economies of tomorrow. The ‘Internet of things’, in which all IP-enabled devices are connected, will enable ‘smart’ systems across a wide range of applications including energy, financial and health as well as medical systems and infrastructure.

We are only beginning to see the possibilities of the new digital economy. In the near future we will live in a world in which drivers are made safer in their vehicles through being constantly connected to information about their vehicle and environment; a world in which companies have access to customers’ wish lists held in the cloud and can respond directly; where a mobile device can make payments directly to another – on the move.

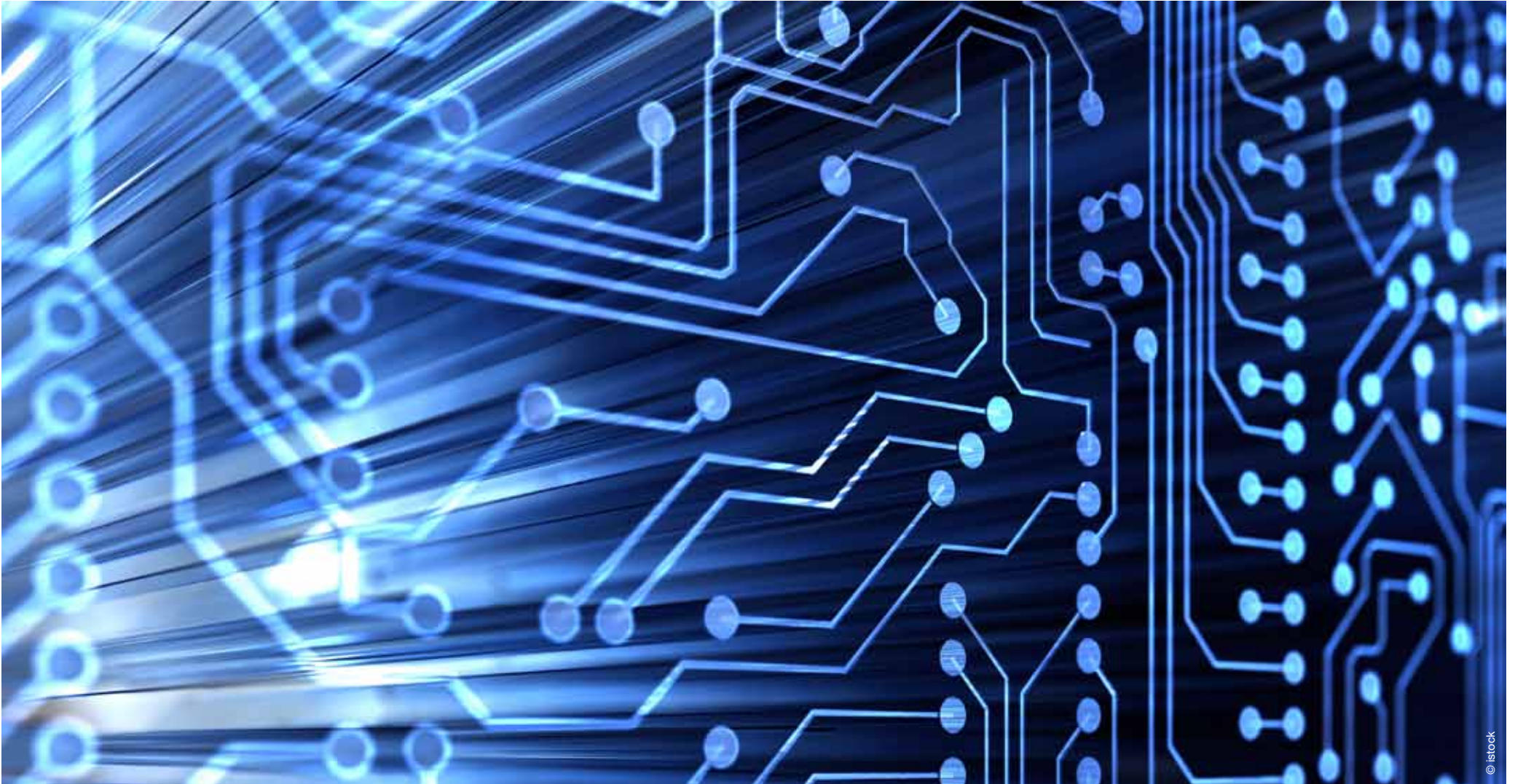
While there are many positive implications arising from these developments, there are risks too. Security of personal and corporate information becomes increasingly vulnerable as the ability of criminals to hack computer systems becomes more sophisticated. Data security is therefore of paramount importance to enable the trust that is a prerequisite for driving broader adoption of digital technology in industries such as financial services and in the public sector.

In addition to the technological changes, there are broad legal, social and financial drivers that are creating the need for new business models and commercial approaches. Not least of these in Europe is the EU’s Digital Agenda that aims to update EU Single Market rules removing barriers and creating safeguards for the digital era. The agenda’s intentions are to boost digital media and entertainment, provide a single area for online payments, and protect EU consumers in cyberspace. The European Commission wants to promote a single market for Intellectual Property Rights. In this context, the set up of a European framework for online copyrights licensing will be done in 2011. A consultation on online distribution of audiovisual works will be launched in order to issue a report in 2012.

Luxembourg has a number of key qualities that place it in a strong position to drive forward innovative initiatives that will allow it to become a hub for e-services and at the heart of new digital business opportunities.

# Chapter II:

## Strengths and opportunities – Luxembourg's journey to become an e-hub for Europe



As part of the preparation for this initiative, members of the working group undertook an analysis of Luxembourg's strengths and opportunities as well as considering the potential challenges that Luxembourg may encounter in its journey to becoming a hub for electronic services for Europe.

The foundations are in place. Luxembourg already has a sizeable industry in IT and telecommunication services, with more than 13,000 employees and an annual turnover of €5 billion<sup>2</sup>. Many of the broad business trends that are changing the global landscape for all businesses find their clear expression in Luxembourg. In a globally connected world, advanced digital infrastructures are critical. Luxembourg's recent major investments to build state-of-the-art data centres and high-speed Internet connections is testament to its commitment to ensuring that businesses can have absolute confidence in the reliability, resilience and security of their information management.

On top of offering highly secure and reliable ICT infrastructure, Luxembourg has a global reputation for the robustness of its legal and financial systems and the protection that they afford to investors. The financial services and banking industries have elected to make Luxembourg a centre for their operations. As a fund administration centre, Luxembourg is second only to the US in terms of the volume of funds domiciled and is the most international centres in the world.

Other industries have also chosen to locate in Luxembourg. Global brands such as Amazon, eBay, iTunes, Paypal, RTL Group, SES and Skype all have European headquarters or major operations in the country and are part of a rapidly developing cluster of businesses that are increasingly prominent in the global economy. Skype, for example, has achieved global success from Luxembourg and in a few short years has established itself as one of the leading web-based communications providers around the world and the leading providers of long distance communication. Paypal has become a major player in the online market and now operates from Luxembourg.

These businesses have been attracted to Luxembourg for a broad variety of reasons. Luxembourg's favourable business framework is one of the most attractive in the European Union. While the advantageous VAT regime for Business to Consumer (B2C) electronic services has helped draw businesses in the country, it is Luxembourg's other attractions that will emphasise its role as a hub at the heart of Europe's growing digital economy. It offers easy access to a European base of more than 500 million customers, benefits from the depth of resources available in neighbouring European countries and its location at the centre of Europe makes it ideal as a hub location, offering fast connectivity to other European cities at low latency rates.

The development of the University of Luxembourg has been specifically designed to meet the business challenges and opportunities of the 21<sup>st</sup> Century. Two main research units operating within the University – the Interdisciplinary Centre for the Security Reliability and Trust (SNT) and the Computer Science and Communication research unit (CSC) have already earned a strong reputation for excellence and are used by some of the world's leading technology businesses to assess and test their digital security.

Luxembourg's main challenge is to promote internationally the numerous advantages of its outstanding ecosystem, which by far offset the impact of some amendments to the tax environment. The country's stakeholders are conscious that Luxembourg requires clarity in its value proposition to the outside world and have therefore started joining forces and coordinating their efforts to market the country internationally. Competition is increasing at a rapid pace and the services offering is expanding, which will contribute to the reinforcement of the country's positioning as an e-hub in Europe.

The following chapter identifies five areas of opportunity for Luxembourg to leverage its combination of strengths and achieve a leading position as a digital services hub in Europe.

<sup>2</sup> STATEC (2008), figures do not include the e-business sector.

# Chapter III:

## Five areas of opportunity for Luxembourg



## Media and entertainment

### A preferred location for global digital brands

Some of the biggest global names in media and Internet have established operations in Luxembourg over the past decade: Amazon, eBay, Paypal, and iTunes – to name just a few. Luxembourg has a proud history in the broadcasting industry: it hosts SES, the global telecommunications satellite operator, and is home to RTL Group – the largest commercial broadcaster in Europe. More recently it has demonstrated that it is a fertile location for the development of new services. For example, Skype was founded in Luxembourg in 2003 and has gone on to become a global leader in its industry: around the world its users made more than 207 billion minutes of voice and video calls in 2010 alone.

### A growing cluster

The country ranks<sup>3</sup> as one of the most connected countries in the world. Luxembourg has leveraged its location at the heart of Europe to its fullest extent to reduce latency rates to single-digit levels. It has made a multi-million investment in its ITC infrastructure by developing multiple pan-European fibre networks – providing connectivity to all the major European hubs and making dark fibre widely available within Luxembourg. While some businesses were initially attracted by Luxembourg's comparatively low VAT rates for the supply of B2C e-commerce services, there are now a number of compelling, complementary factors for e-commerce and digital entertainment businesses to set up operations in Luxembourg on top of benefiting of a European market of 500 million consumers.

### A strategy for a digital future

Luxembourg is not only at the centre of Europe geographically, but also intends to be at the heart of Europe's digital future. The EU's Digital Agenda is a political commitment agreed between all Member States to build a single market for e-services in Europe, and to remove the barriers for both businesses and consumers that impede the natural growth of such as market today. This implies improving the EU-wide licensing of copyright for online services as new Internet-based services such as webcasting or non-demand downloads need a license covering their activities throughout the EU. A breakthrough in this area would create a clear opportunity for developing standards and processes that will enable digital media and entertainment businesses to reach the entire EU market from a central, secure and state-of-the-art location. That requires the technical, legal and fiscal environment – as well as high quality human resource and the capacity to serve as a test market – to operate in harmony. That's exactly what Luxembourg can achieve in this context.

<sup>3</sup> OECD Broadcasting statistics (2010).

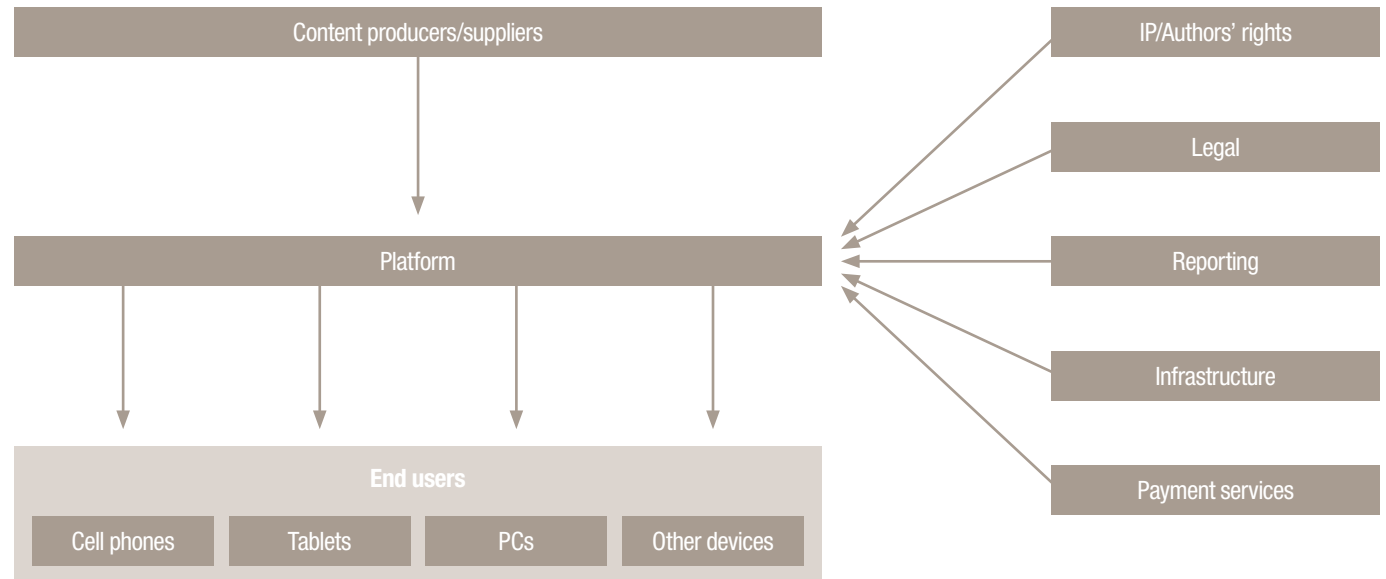
## Creating a digital content platform in Luxembourg

As media content is digitised and new formats emerge, all media and entertainment businesses need to ensure that their content is available for any and all devices at the click of a mouse or the touch of a screen. Making content available literally at consumers' fingertips requires an efficient and secure platform for developing, ingesting, storing, formatting and distributing content. Meeting the demands of consumers in many different countries with content in multiple formats suitable for a fast proliferating range of devices is a complex and costly challenge.

In response, media businesses have the option to operate their own, standalone distribution platform. But the capital investment required is significant. In a fast moving digital world there is a danger of obsolescence. The high costs associated with building and operating a sophisticated and robust digital content platform can act as a barrier to entry for new businesses and ventures.

As an alternative it, therefore, makes sense for media companies and content owners to consider using a common platform for the production, management, licensing and distribution of digital contents and associated data. Such a platform should integrate the management of authors' rights and some reporting functionalities. It should be operated by a third party or consortia, that would meet these companies' expectations of business security and reliable access to world-class content management and distribution services.

Diagram: Concept of the platform



A single platform could integrate all requirements in a one-stop-shop in order to offer more efficient and effective processes. Key management information about digital media activity can be used to enable more personalised digital marketing strategies that are built around highly detailed knowledge of consumer preferences and behaviour.

As well as music, video, linear and non-linear TV and games, there are other new categories of digital products emerging. A common platform can support their development, too. Sales of e-books, for example, have enjoyed explosive growth in the US and in 2010 achieved more than \$1 billion in annual sales. Similar growth of the e-book business is expected to follow in Europe, so this is a market waiting for takeoff – and one that lends itself to the creation of a platform for multilingual content management and distribution across the EU.

#### **Proven capabilities**

Luxembourg already operates a considerable number of high-end back-office support functions for global fund management businesses but also for e-commerce. Similar requirements for digital media may emerge as a result of the centralisation of the development and distribution functions in Luxembourg. The country also has the technological infrastructure that digital businesses require. The government is committed to ensuring that infrastructure and connectivity keep pace with the rapidly developing needs of businesses and consumers.

#### **Actions required to develop a digital media platform:**

- **Investing in the platform development**

On top of the technical development of the digital content platform, its commercial launch requires a clear definition of its business model and strategic positioning in a rapidly evolving environment, the legal structure to provide the security required to content developers and end users and its international marketing and promotion. Such investment can only be viable under a private initiative, backed by public funding and support.

- **Adapting the legal and tax environment**

While much of the legal, tax and regulatory infrastructure in place today in Luxembourg is ideally suited for locating a media business's European headquarters, there are some areas of the law that will need to be adapted in order to reflect the needs of content owners and distributors basing their operations in Luxembourg. Most importantly, policy makers will need to consider that authors' rights, innovative non-patented technologies as well as technological know-how are offered the same treatment as other forms of IP under the present beneficial tax treatment of certain income generating IP.

- **Creating a supportive culture for entrepreneurs**

While some relevant public initiatives have been launched, the development of an entrepreneurial culture in Luxembourg could be accelerated. Access to financing should be enhanced. Educational programmes should be tailored to match the requirements of a content production and distribution marketplace. In addition, coaching capabilities should be developed to help would-be entrepreneurs understand the steps they need to take to create and develop a business. To reinforce this, inexpensive access to advice on tax, legal and accounting issues needs to be provided and its availability communicated effectively.

## Financial services

### *Asset management*

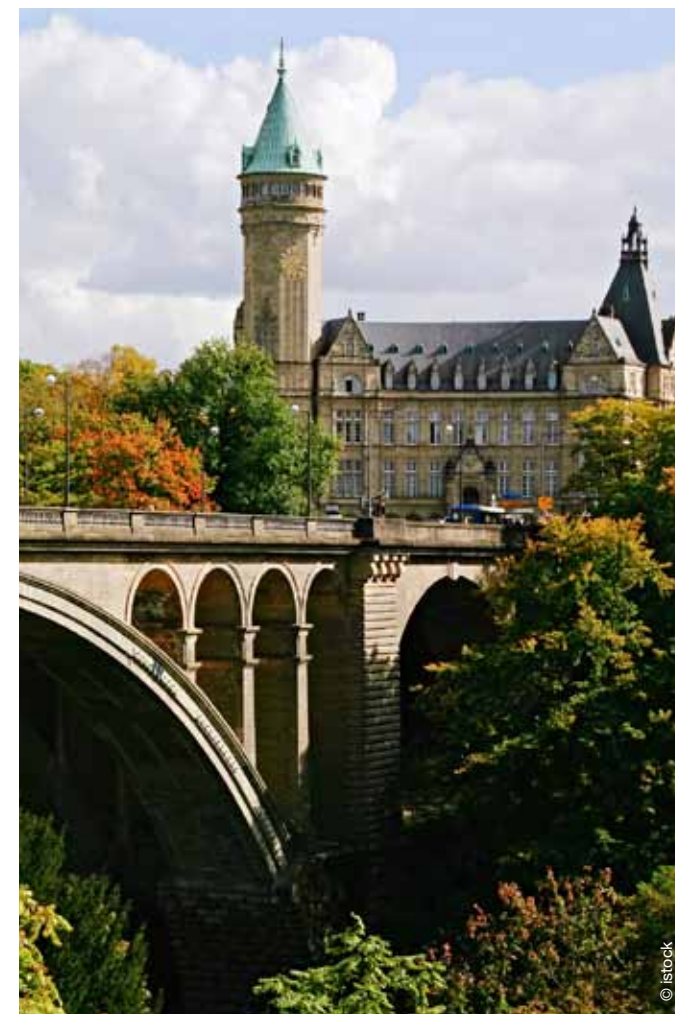
Today, Luxembourg enjoys a global reputation as a centre for fund administration activities. As the second largest fund domicile after the US, and the most international, Luxembourg is recognised for the quality of its regulatory framework and world-class operational capabilities. These deliver diverse processes across global asset classes, financial instruments in multiple currencies and manage many different types of investment funds.

Luxembourg is clearly seen as a global fund administration leader with an unmatched depth of expertise, a strong reputation for data security and increasingly becoming known for developing leading technology and communications platforms. It is a combination of these advantages that could put Luxembourg in the driving seat towards the future of the asset management industry.

### **Responding to complexity**

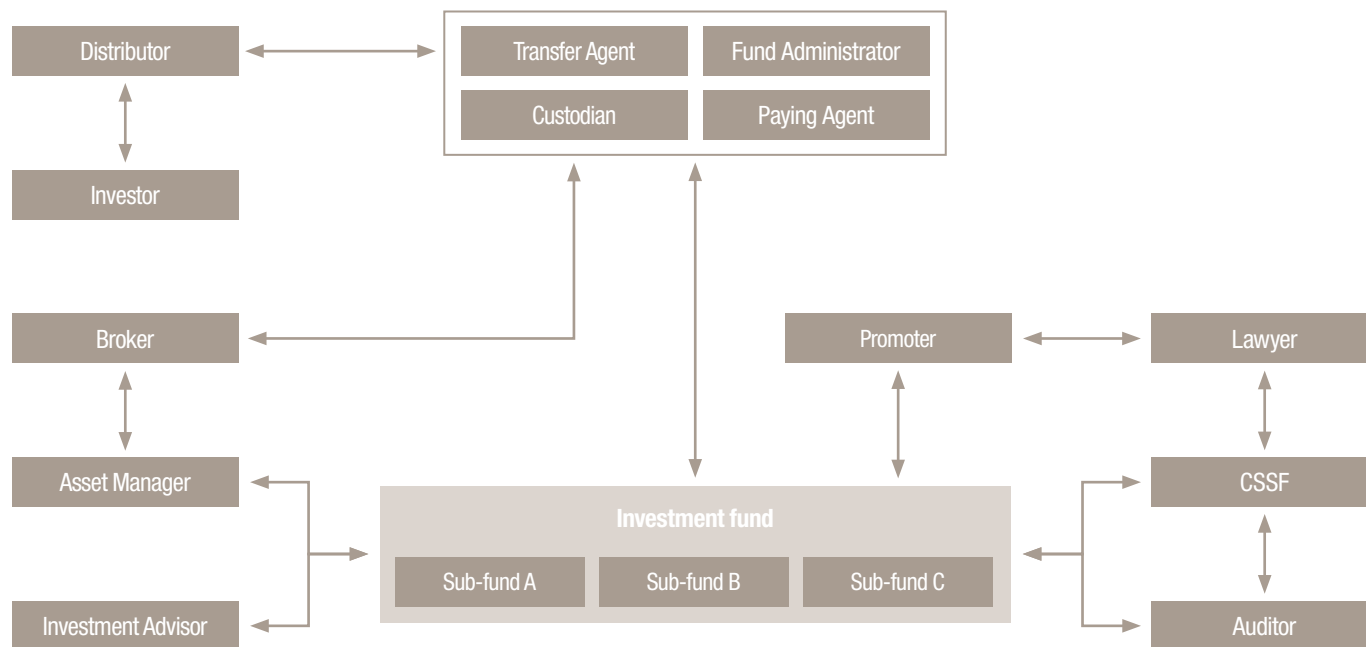
The growing complexity of the investment management value chain, and the increasingly international nature of investment activity, coupled with the growing range of intermediaries, means that many aspects of the chain between fund promoters and end investors are fulfilled using manual processes that reduce efficiency and increase risks.

The asset management industry clearly has the opportunity to improve and automate processes in order to secure productivity gains, tighten risk management and achieve business process excellence. While the first wave of automation in the industry has secured a degree of improvement, a number of gaps and disconnects in processes remain both between participants in the value chain and within discrete functions (see diagram on the next page). This calls for further automation of processes between elements of the value chain and the automation of processes within each element to create a new e-fund industry.



Adolphe Bridge and Petrusse Valley

Diagram: Complex fund management supply chain



A further aim is to drive better intelligence about investor requirements and behaviour. Using advanced analytic capabilities will provide promoters with the insights they need to build investment products that meet investors needs and, critically, are designed with investment outcomes in mind, in contrast to the standardised approach to portfolio composition that is the market norm today.

There is now a real opportunity to move to the next generation of applications in order to achieve significant business improvements. In particular, this means adopting real time capabilities and integrating an array of applications in order to enable more detailed and accurate reporting, providing enhanced risk management capabilities and greater end-to-end control. This may be achieved by setting and using globally recognised standards such as XBRL<sup>4</sup> where there is a need to maintain and further develop the standard itself and to set industry specific taxonomies (relevant especially to the already well developed funds industry).

In the face of new and emerging regulations – such as UCITS IV<sup>5</sup>, AIFMD<sup>6</sup> and FATCA<sup>7</sup> – that will serve to deepen the complexity of fund management and emphasize risk management capabilities, the demand for innovation and automation will only become more urgent.

4 Extensible Business Reporting Language.

5 Undertakings for Collective Investments in Transferable Securities.

6 Alternative Investment Fund Managers Directive.

7 Foreign Account Tax Compliance Act.

## Potential next generation applications

While there is plenty of scope for development, some of the key applications that are likely to be required include:

- *Executive dashboards for real time risk management*  
There is a need for a management dashboard that provides senior executives with an at-a-glance overview of risks, and operations as those become more complex. These can be compared to the executive dashboards that are common in a range of industries – and as a fund management industrialises. These will become increasingly critical for effective management oversight.
- *Automatic reconciliation*  
Applications to drive automatic reconciliation, using artificial intelligence to extract data from a range of inputs and drive automated processes that will eliminate errors, drive efficiency and lower operational costs.
- *Over-the-counter (OTC) transactions automation*  
OTC contracts that today largely rely on manual processes offer significant scope for automation to drive greater efficiency and control. This applies both to transaction management and contracts management of corporate actions underlying OTC trading.
- *Ex-ante investment controlling*  
To enhance portfolio and risk management there is a clear need for tools to automatically check the impact of an investment on portfolio composition in line with fund rules and limits and broader compliance requirements.
- *Investor intelligence*  
Distributors and fund promoters require more intelligence to drive deeper insights for product development and to enhance understanding of investor requirements across the entire value chain. This requires analytical engines and processes to extract and aggregate transaction and investor information from the substantial database of transactions executed through Luxembourg.

## Actions to drive the creation of the e-fund industry in Luxembourg

The following steps will help Luxembourg to stimulate the growth of next generation applications for the fund management and lead the development of an e-fund industry:

- Development of a specific growth plan for the e-fund industry – capitalising on the unique concentration of fund management expertise and IT infrastructure in Luxembourg.
- Creation of a commercial laboratory dedicated to investment funds, in which IT and telecom companies can test and experiment new applications and tools in a laboratory that would contain and simulate all key investment processes and data of the fund management value chain. This lab would attract developers to design, test and validate new applications and will act as a demonstrator for IT companies in a platform/technology neutral environment.
- Provision of R&D grants for the development of new IT applications containing new algorithms and exclusive functions.
- Identification and management of a community of fund management industry players and venture capital providers, focused on the development of new applications and financing start-ups.

### *Innovative payment services for the e-economy*

The e-economy requires innovative payments services which keep the pace with the many e-services provided to the customers. Despite the fact that the current payment services and the underlying payment instruments are currently modernised on a legal, technical and operational level, emerging and new payment systems are to be developed and made available.

These payment services must be convenient, reliable, secure and available at limited cost. Finally in order to be successfully adopted by customers they should be innovative and improve the customer's experience compared to presently available services. New services are still to be developed in the field of electronic money, mobile payments and e-payments.

#### **Electronic money (e-money)**

The use of e-money is spreading fast in Europe. The European Central Bank reports that to March 2011 there was more than €2.1 billion of electronic money in circulation in the Eurozone<sup>8</sup>. This figure was up from less than one quarter of that amount at the same period of 2008.

With the passage of European e-money legislation into the laws of every Member State in 2011, transposed into Luxembourg law on 19 May 2011, that growth is set to accelerate rapidly. In 2007 the European Union approved the Payment Services Directive and in 2009 the Electronic Money Directive in order to facilitate developments in electronic payments in general and in online payments in particular and to ensure fair competition between traditional banks and new payment services providers such as payment institutions and electronic money institutions. So, for example, telecom operators with an electronic institution licence could enter this developing market.

This legal framework provides the basis for a major development in the way that EU consumers will pay for the goods and services they use. However, there are a number of challenges that need to be overcome before the use of electronic money – particularly between mobile devices – really takes off.

#### **Mobile payments (m-payments)**

Uniform standards and protocols are needed. As are the highest possible levels of security to drive consumer confidence and encourage mass adoption of the new payment instruments. During the next 18 months, these standards, protocols and rules that are under joint development by the banking and the mobile network industries should be available.

<sup>8</sup> ECB Monetary Statistics (April 2011).

Luxembourg is particularly well placed to address these challenges for a number of reasons.

Luxembourg's existing financial services ecosystem has a strong reputation for services availability, security and robust data protection. In addition, many of the major established e-businesses in Luxembourg have already started to develop e-money capabilities. For example, Amazon has successfully achieved regulated status as an electronic money institution and is appropriately regulated by Luxembourg's supervisory authorities. PayPal, an important player in online payments, has been operating from 2007 with a Luxembourg banking licence and could therefore develop its electronic money services offered from Luxembourg.

In addition to its strengths as a financial services and e-business cluster, Luxembourg is also at the forefront of developments to create the necessary levels of security that will generate consumer confidence and allow mobile payment systems to proliferate. The University of Luxembourg's Laboratory of Algorithmics, Cryptology and Security (LACS) and the Interdisciplinary Centre for Security, Reliability and Trust (SNT) are global leaders in developing the technologies and thought leadership that will underpin the secure operation of e-money. The laboratories are regularly consulted by leading technology companies to test the robustness of their applications and devices.

#### **Actions to facilitate the development of innovative payment services for the e-economy:**

- To capitalise on its advantages, Luxembourg should create a working group comprising representatives from the public and private sectors. This should draw on the expertise from the financial and e-business sectors to help develop the frameworks, standards and protocols that will accelerate the deployment and adoption of innovative payment services such as e-money, m-payments and e-payments and position Luxembourg firmly at its commercial centre.
- Luxembourg should serve as a test-bed for major players' innovative payment services projects. Its limited size, high quality infrastructure and readily available know-how make it an ideal environment for testing.
- Encourage communication between public and private sectors, stressing the key advantages of Luxembourg.



Grand Ducal Palace

## Energy and smart grid

The development of the smart grid is one of the most challenging engineering and technological initiatives being undertaken anywhere in the world today. It is also one of the most important. A smart grid – in which communication technologies are embedded in the electricity distribution system – has the potential to transform the way that power is distributed and consumed and is a critical step on the journey to securing a low carbon economy.

More like the Internet than an electric network, a new smart grid system will connect smart meters, high-efficiency transformers, digitised substations and other equipment through a centralised information and control systems. These will continuously monitor status, identify and automatically dispatch teams to fix outages and provide useful information to improve reliability, efficiency and productivity from power generation through to consumption.

For Luxembourg, investing in the modernisation of the energy grid will spur the nation's transition to a smarter, stronger, more efficient and reliable electric system. The end result will promote energy-saving choices for consumers, increase efficiency, and foster the growth of renewable energy sources like wind and solar and improve nation competitiveness.

Luxembourg's scale lends itself to serving as a test-bed for the future development of smart grid technologies. This is particularly important in terms of consumer acceptance and reaction, as shifts in consumer behaviour are simultaneously a major opportunity and challenge for rolling out the smart grid.

**Smart meters** serve as a key interface in a system that combines a number of elements – intelligent meters, a two-way communications network using open standards, and sophisticated operating systems and databases. Smart meters enable customers to go online and monitor how much energy they have used by the month, day or hour – and receive information in real time. Information empowers customers to control their electric bills and make decisions about their electricity consumption. Ultimately, smart meters and the network that connects them will provide consumers with the ability to see and manage individual devices consuming electricity in their home such as air conditioning and appliances. Smart meters will also provide energy utilities with information that will help them to operate more efficiently and enhance reliability.

### **Strategic objectives**

The principal aims of the smart grid vision for Luxembourg are:

- Empowering consumers to save energy and cut utility bills;
- Making electricity distribution and transmission more efficient;
- Integrating different 'smart' components;
- Building a smart grid services industry with the associated development of skills and expertise allowing the positioning of Luxembourg as one of the European leaders in this field;
- Make Luxembourg the most advanced European country in smart grid infrastructures and services.

### **Actions required to deliver the smart grid vision:**

#### **• Roll out of smart meters**

Smart meters should be installed in thousands of homes and in most businesses in Luxembourg. Using the capabilities of installed smart meters, the initiative should conduct studies of additional consumer communications and empowerment systems to determine which deliver the greatest energy savings and consumer satisfaction.

#### **• Consumer technology trials and understanding the impact on consumer**

The initial trials in approximately 1,000 Luxembourg households should test several different systems including:

- In-home energy displays or 'eco-panels' to help manage electrical loads and lower power use during peak periods;
- Smart appliances that can communicate with smart meters to reschedule high energy functions or switch to a lower-consumption modes during peak demand.

#### **• Renewable Energy Integration**

Several local organisations and schools should receive renewable energy installations to help meet energy needs with renewable, non-polluting technologies. Battery installations will enable some solar locations to store power for use during times of peak demand.

#### **• Plug-in Hybrid Electric Vehicles (PHEVs)**

Several plug-in hybrid electric vehicles should be added to the fleet serving Luxembourg towns. The PHEVs should be powered through approximately 50 new charging stations. Additional PHEVs should be rolled out in trials.

### Machine-to-machine networks – the next Internet revolution

The smart grid is one manifestation of a fast developing trend towards machine-to-machine (M2M) connectivity over IP networks. What that means in practice is that devices will be able to exchange information with one another, with no human interaction. This capability is nothing short of revolutionary in the way that a wide array of activities – from manufacturing cars to operating public transport – will be routinely carried out in the future.

However, before the benefits offered by machine-to-machine networks can be realised, a number of obstacles to their adoption need to be overcome. Not least of these is the development of common communications standards and protocols. Additionally, confidence in the security of machine only networks will be a major driver of adoption. From a commercial perspective, the business case for adoption also needs to be developed and substantiated. While many companies can see the potential of M2M few feel ready to commit the substantial investment that will be required to develop and implement the technologies needed.

### Actions to drive the M2M network

In order to accelerate adoption and to develop solutions that will demonstrate the commercial potential of M2M networks, Luxembourg could create working groups and cross-industry public-private partnerships to explore the possibilities of this next-generation technology and establish the country as a pioneering player in Europe in the Internet's next iteration.



## Cloud computing

As well as meeting the immediate needs of many businesses – where technology is already mature – Luxembourg’s infrastructure strength gives it a major opportunity to lead next generation developments in cloud computing.

Cloud computing – i.e. providing transparent, on-demand infrastructure, applications and services from remote servers on a pay-per-use basis – is becoming an increasingly pervasive technology choice as organisations seek to avail themselves of the cost and operational benefits of not having to develop and maintain their own infrastructure.

However, many organisations in certain sectors (e.g. financial services and government) are nervous about moving to cloud-based infrastructures for security reasons. Existing legal and regulatory frameworks should provide the guarantees and protection that are required to persuade organisations that routinely manage sensitive and confidential information of the robustness of cloud offerings and encourage them to adopt cloud solutions for a wide range of their IT requirements.

The current perceived lack of high security cloud offerings plays directly in favour of Luxembourg’s established strengths, namely extensive top level infrastructure in terms of telecom and data centres (Tier IV design) and a high degree of maturity in the management of confidential and sensitive data.

### **The Cloud opportunity**

Luxembourg’s opportunity is to combine those positive factors to bring about a specialised ecosystem dedicated to highly secure cloud computing hosting, complying with the highest industry standards. By doing this, it will be possible to offer the benefits of the cloud (e.g. scalability, pay-per-use, flexibility) to critical and sensitive applications that, owing to concerns about security and confidentiality, have to date shied away from existing cloud operators.



European institutions quarter

### Actions to enable the highly secure Cloud

To drive this ambition forward will require a number of complementary steps that can foster confidence and marry business logic with legal certainty and security to make a compelling secure cloud offering.

Creation of an updated legal framework:

- Protection of the customers using services provided from the cloud (e.g. security of data, strict assurance over customer data recoverability in the event of bankruptcy; excluding cloud computing assets from seizure by creditors and by providing a liquidation period for the transfer or takeover of data by the customer or a third party of his choice).
- Transparency and traceability of services.
- Segregation of resources and sensitive data protection.
- International certification for cloud services.
- Luxembourg to take a leading role in international discussion of specific standards and ensure that it is among the first to adopt them.

Those guarantees would benefit all operators that decide to apply for secure provider status with the supervisory authority. Operators would also have to comply with the latest international standards to reflect the premium positioning of secure cloud in Luxembourg and develop in effect a Luxembourg cloud 'brand' that was associated with the highest standards of security and effective regulation.

This will require the combination of technical excellence, an attractive business environment for entrepreneurs and venture capital providers and the development of local academic and research capabilities to drive innovation. Specific interventions might include:

- Retain and extend the competitive tax environment for funding and sales of cloud based solutions.
- Offer comprehensive cloud platforms (PaaS<sup>9</sup>), through public and private collaboration, to ease the costs of software development.
- Develop the conditions in which venture capital can flourish in order to maximise the opportunities for innovative entrepreneurs to develop and commercialise their ideas.
- Reinforce the local talent pool by establishing dedicated IT academic curricula that focus on cloud developments.

9 PaaS: Platform as a Service.

## Digitised workflows

Another major opportunity is the digitisation of the whole information management value chain for a very wide range of official and legal uses – including everything from identity documents to complex financial transactions. Few legal and administrative processes today are fully digitised. Manual processes are often required to complete elements of a transaction or formal procedure. Where there is a digital flow of documentation this often operates in parallel with, rather than instead of, a ‘hard-copy’ paper trail.

Moving to fully digitised workflows requires more than technological capabilities. While technology is the enabler, security, trust and confidence in the integrity of digital documentation will be the critical drivers of adoption. To create those conditions specific interventions are required to develop an appropriate infrastructure of standards and regulation that can help a wide range of users to accept and adopt many forms of digital documentation as the direct equivalent of their physical counterparts.

### e-Government

Efficiency, availability and reactivity are major assets in the global competition for new businesses. With the national e-governance roadmap and the adoption of interoperability standards, Government agencies and administrations are expected to play a model role in the promotion and the adoption of digitised workflows. Generally, decisions like the widespread adoption of intelligent forms like ‘e-Guichet’ and e-invoicing tend to help drive awareness, trust and eventually the adoption of digital transactions.

Similarly, the healthcare sector and social security have generally proved to be excellent showcases for digitisation, with huge benefits in terms of synergies, process optimisation, traceability and reactivity.

### Actions to accelerate the move to digitised workflows:

- To develop a reliable, interoperable and affordable digital ecosystem for individuals, companies and administrations alike. This entails to rapidly implement measures laid down in the government programme and to ensure proper supervision while keeping the cost of the tools and related services at a very competitive level.
- By promoting adoption and demonstrating the possibilities and varied applications of robust, secure and efficient digital documentation among its own citizens, companies and administrations Luxembourg has an opportunity to act as a showcase to the world and position itself at the forefront of developments.

## Chapter IV:

# 2012-2015 Action plan for building a distinctive and competitive ecosystem



**A well thought through ecosystem is the foundation on which the opportunities for specific industries highlighted in this document rests. While technology is an enabler of digital business and e-services, it is by no means the only critical element. A wide range of areas such as human capital, finance and communication also have an integral role to play in developing an e-services ecosystem on which success in economic development depends.**

**The following actions are crucial to building an e-services ecosystem that can facilitate digital opportunities.**

## Human capital

Despite the financial crisis and ensuing recession, the war for talent has showed few signs of abating. A territory with the capacity to appeal, educate and retain a highly skilled workforce acts as a magnet. Specific steps that Luxembourg should take include:

- Promote and position Luxembourg at an international level as a place with highly attractive jobs in ICT via Luxembourg for Business. The Luxembourg ICT market is likely to become a well-known centre with attractive ICT jobs for premium brands. Just as the financial centre marketed itself through collective actions, the ICT sector needs to do the same. For example, promoting Luxembourg in the most popular ICT professional and business magazines would serve to reduce individual companies' cost of recruitment.
- Integrate the needs of the Luxembourg ICT marketplace in the education programme of the neighbouring 15 universities with an engineering education programme. Partnering with those universities to develop adapted engineering programmes and masters will facilitate the involvement and the retention of graduates in the region.
- Create incentives and programmes to encourage companies to hire junior talented people, offer them training and ensure the expansion of a pool of talents in Luxembourg.
- Develop partnerships with other international universities (via student exchanges). Collaborating on research and education programmes with selected international best in class ICT universities will help Luxembourg to position itself in the club of world-class places to research, innovate and work. This will create a premium for people to come and work in Luxembourg. Students will come on exchange for several months and it is likely that a proportion of them will be offered a position in Luxembourg.
- Develop bilateral agreements on ICT resource exchanges with developing countries that have a highly qualified workforce. Several developing countries less than a 3-hour flight from Luxembourg have a well-qualified pool of engineers who remain unemployed due to limited opportunities in their home country. For many reasons, attracting them to Luxembourg may not constitute the optional solution. However, facilitating business relationships and resource exchanges between Luxembourg companies and a local partner or branch would constitute an appropriate and sustainable solution for countries, companies and employees.
- Create an employment framework for countries outside the EU in order to facilitate accelerated work permits for in-demand expertise.

## Infrastructure

Leading the way with advanced infrastructure is a prerequisite for achieving Luxembourg's vision to become a digital hub for the 21<sup>st</sup> Century. This requires concerted efforts and investment to build on the foundations already established, increasing the speed and availability of connections, moving ahead with innovation of data centre technologies and ensuring maximum connectivity to international Internet hubs.

- Accelerate the roll-out of ultra-fast broadband to Luxembourg citizens and businesses and guarantee the redundant access for business zones, as foreseen in the broadband strategy presented by the government in 2010. In order to encourage competition and choice, the multi-fibre networks to be deployed should be open and guarantee access to telecom operators in a transparent, non-discriminatory way and at a reasonable cost. This will enable the development of new services from new operators and will maintain or even improve the country's competitiveness.
- Ensuring an 'open network policy' through strong regulation will ensure that markets become more attractive to new players as barriers to entry are lowered. New players can enrich competition while investing effectively. In the future, multinationals and investors will consider the availability of at least two independent telecom infrastructures, powered by independent energy sources, as a key competitive factor.
- Lead the development of innovation for data centre technology. Data centres are becoming more modular, more flexible and are absorbing an increasing number of new technologies. While technology historically refreshes every three to five years, data centres were designed to last for 20 years. With the rising cost of energy and the explosion of data, data centres will have to find more efficient ways to operate. Most data centres' clients have specific needs and configurations. Therefore, the idea of operating with a flexible model is becoming more popular as clients' requirements in terms of power, capacity and security increase. It is also important to ensure that the needs of different industries can be accommodated with the appropriate array of technology. This would mean, for instance, Tier I for gaming alongside Tier IV for banking and financial services. As it is not possible to predict what new technologies or models will be, there is a need for a highly innovative model that can address these needs, while meeting ever increasing business, social, and regulatory demands for high energy efficiency. So building a leading innovation and development platform for data centres' technology and business model constitutes Luxembourg's best chance to stay at the forefront of this critical infrastructure for the development of the digital economy.
- Further develop Luxembourg's international connectivity. This should remain at the top of the agenda for the coming years in order to ensure the lowest latency rates with major capitals, the cheapest prices and the presence of the most important global carriers. Increased competitiveness will arise from improving connectivity between Luxembourg and major Internet hubs at an international level.

## Commercial laboratories: Prototyping and validation services and Luxembourg showcases

In many of the industry opportunities described in the previous sections, the case for developing a commercial laboratory for prototyping, testing, validating and certifying services becomes more and more compelling. Most commercial laboratories will be industry-specific but some common shared infrastructure may help reduce investment and operating costs.

- Develop prototyping, security testing, technology validation and certification services with international standards to facilitate technology start-ups and companies developing new products and services to be tested on the market before launch.
- With the rapid emergence of new technologies, technology promoters (content developers) and their end-users have an increasing need to test, validate and demonstrate new value propositions and understand the limits of new technology in a 'real world' environment. The creation of demonstration platforms would attract technology providers, research programmes and their clients and would position Luxembourg at the forefront of market innovations.
- Assess the feasibility of prototyping and validation services within Public Research Centres, the University and other bodies in collaboration with private companies. The demonstration platform should be operated with attractive and distinctive services in partnership with private companies. The assessment of the potential roles of the public bodies should be undertaken as well as the selection of a private operator.
- Develop showcases for industry specific opportunities. For awareness and demonstration purposes in a European environment, the development of Luxembourg showcases is becoming very important to attract technology companies, potential clients of these technologies and financiers. These showcases could be developed in the following areas: smart grid, smart retail, investment funds, e-money and mobile payment, information and communication technologies, cloud computing and security.

- Drive an active public procurement policy to invest in new technologies. Public procurement of new technologies plays a key role in building risk absorption capacity and demonstrates the willingness of the country to accelerate the deployment of new technologies in order to gain efficiencies. It is important that some public bodies or administrations have a mission to introduce and test new technologies with the appropriate budget in their working model. This will help build the credibility of young, promising companies.

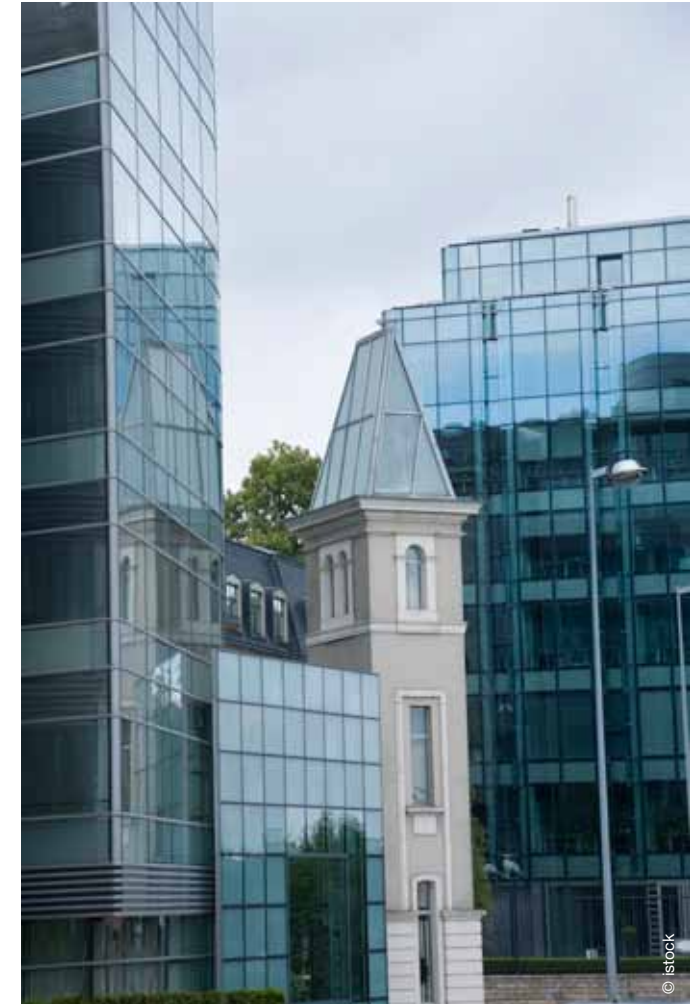
### **HOTCITY: a test platform for new applications**

HOTCITY, an initiative launched by the City of Luxembourg in 2007 has become the most advanced municipal WiFi network in Europe. But HOTCITY is way more than a WiFi network, it has broadened its activities to the development of IT-services for everyone. It is both a marketing platform featuring commercial activities and innovation and an open platform for economic and commercial development. Thanks to its technical assets, the platform offers a large scale of applications that make everyday life easier (HOTCITY Walker, Vis-it, QR code reader...). Recently HOTCITY is finalising a hybrid application which will contain all the existing HOTCITY apps. It has to be downloaded once and every time a new app is created by HOTCITY, it is added automatically in this 'shell' without the end user having to take any action. Furthermore, it allows the user to switch easily and quickly between the different Apps, which are based in the 'shell'. HOTCITY could provide a test-bed for new technologies and applications.

## Finance

Following the financial crisis, the availability of supportive financial mechanisms as well as risk sharing schemes is fundamental to developing new technology-based activities. Several member states and European regions have revisited their financial tools to better support strategic activities including in the ICT domain. Accordingly, the Luxembourg financial tool box could be developed around the following elements:

- Develop an attractive intellectual property investment funds framework. Several asset managers and corporates are now planning to launch intellectual property funds composed of IP rights which will be monetised through license rights. This investment fund structure tailored for intellectual property rights could be a significant enabler for attracting and developing new IP in Luxembourg.
- Foster a community of early stage capital funds. While some well-known ICT venture capital funds have established their operations in Luxembourg, the industry is not yet organised as a community with the result that making contact and building relationships with several financiers can be a long and costly process. Building a community of European and US VCs around attractive companies sales pitches in Luxembourg will significantly help all actors to accelerate the company funding process.
- Create finance guarantee mechanisms. In the ICT industry, many companies are young and lack a strong balance sheet. Bank financing is often difficult to access and this limits company development. The creation of an investment fund providing bank financing guarantees to young and small ICT companies would be highly important to reduce the risk perception, assist banks to better manage the credit risk and develop the activities. For instance, a 5% loan portfolio guarantee to banks issued by a fund with €10 million assets would generate €200 million bank loans to the sector.



Luxembourg City

## Economics

Luxembourg e-services comprise several sectors and sub sectors. Assessing the weight and growth dynamics of these activities is a real challenge. The strategic importance of information technologies and communications associated with digital content and e-commerce activities for the Luxembourg would justify to:

- Carry out a precise and in-depth economic impact analysis of e-services activities in the Luxembourg economy. Some years ago, Luxembourg financial sector undertook a similar exercise to assess the real economic impact of financial activities. This assessment has been followed by regular updates that create strategic information to share between different stakeholders.
- Develop a Luxembourg business case for authors' rights activities and appropriate measures to support these activities. Understanding the overall economic opportunities available from copyright industries (publishing, music, film, etc.) and the appropriate set of measures and competences, including regulatory and tax changes, required to capitalise on this major opportunity should be considered. Analyses, such as the one conducted by the IIPA<sup>10</sup> in the US measuring the impact of copyright industries on US GDP, should be carried out for Luxembourg.

## Regulatory and tax framework

Attracting the strategic players in the areas of opportunity identified must be backed with a coherent tax and regulatory framework, competitive with other locations. To achieve this, the following actions have been identified:

- Assess the opportunities with regards to technological know-how as well as non-patented innovative technologies in the current IP regime under Article 50bis of the Luxembourg Income Tax Law.
- Introduce a dedicated regime of tax incentives for researchers aimed at attracting and retaining a highly-qualified workforce, similar to and competitive with what other jurisdictions currently offer, e.g. tax credits/deductions for employers in relation to hiring specialised workforce in the sector and related employee tax incentives<sup>11</sup>.

- Communicate the operational issues raised by new VAT rules. Luxembourg should be prepared to communicate to the European Commission the operational issues raised by the new VAT rules and those that the relevant industries pointed out. Under the compromise reached during the ECOFIN council meeting in December 2007, the opportunity to apply the new VAT rules from 2015 will have to be the subject of a report to be drafted by the Commission by the end of 2014.
- Consider direct tax incentives to compensate the loss of VAT tax regime.
- Luxembourg must market its experience of the ICT framework to attract the one-stop-scheme VAT registration after 2014. It should also put forward its acquired experience in the ICT industry and the presence of human resources with a significant knowledge of European VAT. The tools made available for e-businesses after 2014 must also be user-friendly, easily accessible and multilingual.

<sup>10</sup> International Intellectual Property Alliance.

<sup>11</sup> Please refer to the new expatriate tax regime for qualifying employees issued on 31 December 2010.

## Governance and communication

The governance of ICT and e-services in Luxembourg and the creation of a development plan are also very important. Today the industry is structured around a number of trade associations that individually lack the critical size to tackle in detail all subjects relevant for the development of the industry. The objective would be to speak with one voice and present a unified position to the government or the European institutions on key topics. This governance will have a huge impact on Luxembourg in terms of both internal and external communications. As actions we would recommend the following:

- Develop an ICT umbrella trade association. This umbrella trade association would focus on better and stronger representation of the industry position towards the government and other key stakeholders and would also facilitate the development of new activities as well as the international promotion of Luxembourg. Opening this umbrella association membership to consultants and lawyers would also facilitate the achievement of working groups. The Luxembourg Investment Fund Association should be considered as an interesting example for its governance model, scope of activities and international visibility. Developing an umbrella association and regrouping the key associations, as well as key companies and brands, under the leadership of a recognised industry player will create high visibility in the market place and will reinforce credibility

as well as the communication channels with government and administrations. This will also help develop a stronger position in the EU context. A first important step on which to build is the recent launch of the platform 'ICTLuxembourg'.

- Draw up and execute a communication plan. Underpinning the achievement of many of these aims is the ability to communicate Luxembourg's aspirations and progress effectively to the right stakeholders. There should be a concerted and collaborative effort by public and private sector players to ensure that Luxembourg's vision for its future is made broadly available and widely heard around the world. The communication plan should address the Luxembourg value proposition for international businesses to set up in the Grand Duchy, and position Luxembourg as a place for attractive jobs in this sector.



Old town

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Philharmonie concert hall

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