

Chapter 14

ICT Convergence and Europe's Digital Agenda 2010–2020

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14.1 Introduction

Information and communications technology (ICT)¹ has made a formidable contribution to economies around the world in recent decades. The initial impact was visible on the production side, but the focus has increasingly shifted to the user side. ICT has led to new and improved products, new industries, new companies, higher productivity, organisational change and new dynamics within both private companies and governments.

Several new phenomena are now in the process of changing the role and impact of ICT. Among these, convergence² will enable ICT users to access a range of services through multiple interlinked devices. Its significance will be comparable with that of other major breakthroughs, such as those stemming from cloud computing and open source (which will be examined in more detail below).

More than anything else, however, the role of ICT and its future effects on the economy and society is critically dependent on non-technological factors. ICT's advance is interwoven with education, human capital formation and the broader societal mindset. The way in which ICT interacts with human capital matters

¹ ICT include computer hardware, software and services, a host of telecommunications functions such as wired (or “wireline”), wireless, satellite products and so on.

² While there is no universal definition of convergence, it is generally understood to mean the ability of different networks to carry similar kinds of services (for example, voice-over-internet-protocol (IP) or over circuit-switched networks, video-over-cable television or asynchronous digital subscriber line (ADSL) or, alternatively, the ability to provide a range of services over a single network, such as the so-called “triple play”).

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greatly for technological readiness, for investment in technological infrastructure investments and R&D, and for ICT-related innovation.

The link between ICT and innovation deserves special attention. The new tools that ICT provides create many opportunities for different approaches. They also continually challenge our established methods of working and learning in virtually all countries—for experts and generalists alike and in both urban and rural areas.

For the emerging new technologies to continue to empower individuals, enrich societies and foster relevant R&D and innovation, it is essential that society can accommodate the required accompanying changes. Governments' role in addressing the outstanding issues is pivotal, although governments cannot and must not handle these questions in isolation. A number of measures are required to ensure that networks are secure and reliable—and these measures must retain the trust of individuals, businesses and governments.

Harnessing the benefits of ICT requires the creation of an environment that allows for stronger combined development and use of new applications—and the broad dissemination thereof to government agencies and the private sector (from large corporations to the vast community of small- and medium-sized enterprises).

These developments affect virtually all countries, with impact intensifying according to a country's level of development. This is because the opportunities created by ICT and the impediments to realising them weigh increasingly heavily with the development process. The GCC countries thus stand to be strongly affected, while other countries across the Middle East will be drawn into this orbit at varying speeds.

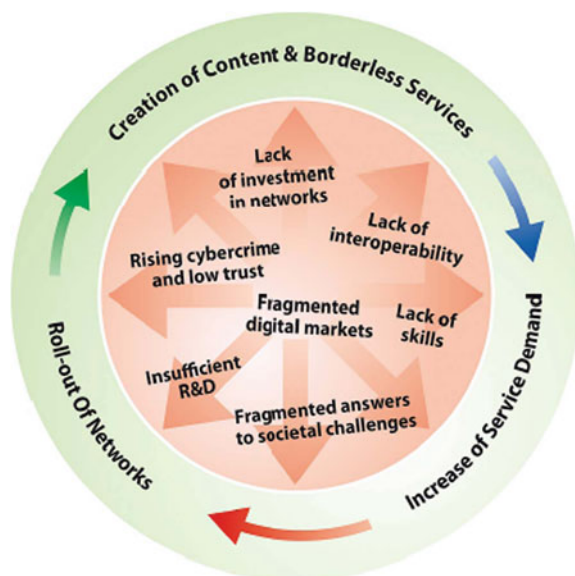
Already as of today, the GCC countries have made concerted efforts in the ICT arena. In some respects, several of them have joined the ranks of world leaders. Mobile penetration in Qatar and the UAE, for instance, is among the highest in the world. There is extensive direct engagement by government through infrastructure investment, for instance in fixed and mobile high-performance networks, as well as in e-government services and regulatory reforms.

On the other hand, there is a lack of effective cross-border collaboration among GCC member states, and also in regard to the wider Middle East, in this area as well as more generally in regard to science, technology and innovation.

Given the integration under way among GCC economies (including the establishment of a common market) and consistent growth in the region's IT usage, it would appear natural for GCC states to join forces in undertaking some joint policies and investments and IT project coordination across both sectoral and national boundaries. In many instances, common initiatives will simply be more effective in developing a digital economy and society compared to unilateral action. Broadband networks, access policies or roaming charges can serve as examples. As this chapter will show, the European Commission has launched a major collaborative effort, "Europe's Digital Agenda 2010–2020", that can offer the GCC countries opportunities if they organise themselves to take advantage.

Fulfilling the potential of ICT, especially in the stages ahead, will require the active involvement of local, national and regional actors from all parts of society—including government, business, civil society groups across all sorts of sectors

Fig. 14.1 Virtuous cycle of the digital economy. *Source* European commission (2010)



(from health and education to transport and energy), thinkers and, above all, doers. The task calls for an effective dialogue, which can allow for exchange of experience and mutual learning between complementary competencies. There is a need to shape a strong and effective digital cooperation strategy that engages all key parties (Fig. 14.1).

This chapter presents observations on the advance of the GCC countries with regard to ICT and then reviews how convergence drives change. It offers reflections on Europe's Digital Agenda and discusses the openings for international cooperation in research and related aspects, along with the implications for the development of trustworthy network services in the rapidly evolving communications field. Finally, it reflects on how to enable new alliances and collaboration through a common vision of the digital future.

14.2 ICT and the GCC

The GCC countries are experiencing some of the most rapid ICT growth in the world, especially with regard to the diffusion of mobile telephony. They have already undertaken a series of large transformation projects in both the public and private sectors that have helped boost the advance and use of ICT.

A range of new measures is also under consideration, spanning legislation, regulatory and infrastructure development, business engagement and investment, and the application of new technologies by institutions through their daily activities. Several GCC states have initiated the development of high-performance

higher education and research networks to connect institutions more effectively with the outer world. However, innovative capacity to help generate the development of new industries and higher value-added well-paid jobs is limited.

Market research by World Information Technology and Services Alliance (WITSA 2009) projected an increase of 8–10 % in IT spending in GCC countries by 2012, and further an accelerating trend in ICT investment by GCC states in the period up to 2015. Some countries are more ambitious, or advanced, than others. In absolute terms, Saudi Arabia naturally invests more than the others, accounting for some 50 % of total GCC ICT spending.³ Next is the UAE, which invests the most relative to the size of its economy and accounts for 25 % of the GCC total in this area, in part reflecting a national effort to promote private sector activity. For all the GCC countries, however, improved coordination and collaboration across the borders could reduce costs, increase efficiency and offset the risk of costly mistakes.

Every GCC country needs to take further steps towards economic diversification generally and towards becoming a genuinely knowledge-based economy (Booz & Co 2009). More than anything else, this will require the appropriate investment in local talent development. Given its role in bringing together people with diverse skills and experience, and in diffusing information and opportunities to the wider community (especially young people), ICT has to be a primary focus of that effort. For that to happen, a comprehensive cyberspace strategy is needed—for the GCC countries individually and for the region as a whole.

When it comes to substantive ICT work and initiatives, intra-GCC cooperation is currently poor. One reason could be the heterogeneity of the region. And yet, the differences between GCC states do not appear wider than those in Europe. Another factor may relate to fear of domination by, or dependency on, others. The degree of cooperation most likely depends on mindset and political choice. At any rate, there are ways to combine market openings and efficiency-enhancing collaboration with enhancement of each participating country's profile. The Digital Agenda for Europe, further discussed below, may serve as a source of inspiration. It encourages a European ICT strategy approach in order to achieve sustainable growth.

14.3 Digital Convergence

ICT convergence brings the world together in a way that very few could have imagined just a few years back, let alone one or two generations ago. Convergence can be characterised in different ways but is certainly no longer empty of meaning; or, as has been said:

³ According to the Kuwait Financial Center, market expenditures in Saudi Arabia are expected to reach \$90 billion by 2012.

Table 14.1 Developing Viable Business Models with Convergence

Multiple service provision under different network infrastructures			
Infrastructure	Voice	Data	Video
Copper line	PSTN	DSL, FTTP	VOD, IPTV
Cable	Some	Cable modem	Analogue, DTV
Mobile	Analogue, 2G, 3G	2.5 G, 3G	DVB-H, others
Fixed wireless	Some (VoIP)	Proprietary, 3G, WiMax, LMDS, MMDS	DVB
Powerline communications	VoIP	BPL	VOD, DVB, IPTV

DSL Digital Subscriber Line, *FTTP* Fibre to the premise, *VOD* Video on Demand, *IPTV* Internet Protocol TV, *DVB* Digital Video Broadcasting, *2G* Second generation mobile service, *3G* Third generation mobile service, *BPL* Broadband over Power Line. Source Telecommunications Management Group, 2011

Convergence is no longer a buzzword used by people who want to stir up the ICT landscape. It is real and starts to happen in nearly all ICT-related fields. It ranges from rather simple convergence cases like fixed-mobile telephone services to much more complex cases involving digital content, networks, services and devices. The emerging “Triple Play” shows where the future could be going (Stollenmayer, 2008).

Convergence is accelerating as existing networks are modified (e.g., upgrading telephone networks to offer ADSL, alteration of electric power networks to offer broadband services, and the modification of cable networks to offer interactive services). Convergence is also possible with wireless broadband technologies. As a result, different network infrastructures provide a plethora of services (Table 14.1). Cable television providers offer consumers voice, internet access, and broadcast services over the same network as one bundled package and for one monthly price. Likewise, a mobile service provider may be able to offer a subscriber data and video services, as well as voice services, and digital television (DTV) providers are coming forward with interactive services.

Convergence has in part been made possible by digitalisation, which allows different types of content (audio, video, text) to be stored in the same format and delivered through a wide variety of technologies (computers, mobile phones, televisions, etc.). Two broad definitions of convergence exist, depending on whether technological and media aspects or content are being referred to. The definitions are shaped to some extent by the context in which they are offered.

Technological convergence refers to the trend whereby a set of technologies initially with distinct functionalities evolves towards technologies that overlap. It occurs when multiple products come together to form one product with the advantages of all of them—e.g. your computer as purveyor of voice as well as text and graphics; and cell phones that provide text and graphics as well as voice.

Media convergence refers to the removal of entry barriers across the IT, telecoms, media and consumer electronics industries, creating one large “converged” industry.

The fundamental building blocks determining the way convergence will take us forward have to do with technology, accessibility and relevant content. The key technological factors are the development of networks and new devices.

For accessibility, the quality of services, regulation and cost are essential. The better the accessibility, the greater the number of people who will become active users. Thus, the ability of vendors to offer high accessibility becomes a key competitive factor.

The same applies to content. Through convergence, content enables and will also be a driver (including through mobile devices) of enhancement of services such as entertainment services, payment services and security centres. This will provide numerous opportunities for the development and wide diffusion of new services in health, education, tourism and other sectors—with major implications for local development and job creation.

The changes brought about by convergence are bound to be universal and global. Increasingly, they will affect virtually all countries, all kinds of organisations and people everywhere.

Going further than convergence, cloud computing is now on the rise. Cloud computing has been an information technology buzzword for several years, reflecting fundamental developments in how to make use of new technological opportunities. Now it is going mainstream. As with convergence, the definition of cloud computing varies. In essence, however, it is about putting more of your material out there, in what is emerging as common space apt for exploiting synergies, and less on an isolated PC or bundle of servers.⁴ Data are stored on server farms generally located in the country of the service provider. Again, the rise of cloud computing reflects a number of coinciding trends that all involve the evolution of the Internet and its potential to magnify as well as simplify the way we use computers and extend their capabilities.

Defined that way, virtually everybody in the business now views cloud computing as the key to the future of ICT. Cloud computing offers opportunities for all, as it provides answers to what IT always needs: the ways and means to increase capacity or add capabilities on the fly without investing in new infrastructure or licensing new software (open source). Cloud computing extends IT's existing capabilities in real time over the internet.

On this basis, cloud computing is on the way to enhancing virtually all applications, including business, health, education, green IT and others. It heightens the benefits of the digital network to our societies and economies. It empowers individuals and businesses. Most governments across the OECD (including in Europe, the US, Canada, Japan, South Korea and Australia, among others) have evaluated and put into effect plans and policies to pave the way for solid implementation. That said, outstanding challenges are nevertheless frustrating present-day applications, such as issues arising from security and identity management.

In a sense, convergence, cloud computing and open source are the result of rapid technical progress, occurring in different and yet inter-related fields that are

⁴ A stricter definition might be the logical computational resources (data, software) made accessible via a computer network (through WAN or the internet, etc.), rather than from a local computer. Data are stored on server farms generally located in the country of the service provider.

coming together and enabling a host of new combined applications. At the same time, competencies and organisational issues are the key to harnessing the benefits involved. Public and private spheres worldwide are engaged in a tremendous effort to meld these individual new technologies to achieve an unprecedented advance in services to end-users. There are no single-bullet solutions. Also, multiple trials have taken place to extend ICT to other industrial fields, including green convergence, smart screens, next-generation broadcasting and media, mobile convergence networks and other ICT convergence applications and services. These attempts have all taken place under the label of ICT convergence.

In these circumstances, a region—just as an individual firm or organisation—needs to be able to plug into the broader regional or international networks of resource flows and exchanges. At the same time, the region also needs to prioritise the kind of infrastructure, networks and content developments that can help to strengthen its unique niche of specialisation and excellence. Both will be required to generate economies of scale, capture synergies and enable effective learning processes.

To date, the European Union has made the most ambitious effort of any group of countries to engage in research collaboration, applying to multiple levels, and with joint efforts around ICT as one of the prime springboards for realising new opportunities more broadly. The EU and GCC share distinct similarities. Both are communities of nation states that can benefit from working together to shape common markets. As we have seen, however, there is a stark difference in the extent to which the two regions have developed internal linkages, with the GCC countries increasingly connecting outward but not among each other. Again, ICT can serve as a bridge builder and leverage factor for more extensive knowledge exchanges, including to overcome the fragmentation of the GCC countries. Broad-based inter-regional collaboration, involving joint work on the issues and opportunities arising from convergence spanning research projects, innovation, commercialisation, enterprise development and job creation, can contribute to enhanced connectivity and synergies within the GCC region as well.

14.4 Digital Agenda for Europe 2010–2020: An Opportunity for Cooperation

ICT is shifting away from being an “interesting issue” to a hugely important factor for economic and societal development, with policy ramifications that cut across national and sectoral boundaries. Hence, coordination is required across these boundaries. In Europe, the coordinating policy institutions are in the process of deploying the Digital Agenda, Europe's strategy for achieving a flourishing digital economy by 2020.

The Digital Agenda outlines a number of measures that need to be taken in order to develop the digital economy and society. Given the scope of the technical

and organisational implications, there will most probably be a profound impact on how we access the internet, how we do business and how we build and protect our families and communities.

In March 2010, the Vice President of the European Commission and European Digital Agenda Commissioner, Neelie Kroes, sought to spur progress by calling for the active involvement of national, regional and local actors from all parts of society: government and business, citizens' groups in multiple sectors—from health and education to transport and energy—thinkers and, above all, doers. The task also requires effective international dialogue that allows the exchange of experience and mutual learning from each other on these issues. There is a need to shape a strong and effective digital cooperation strategy that engages all key parties.

At present, the European Union is not actually a union when it comes to the digital universe. The EU is potentially ultimately borderless, but its manifestations and development are influenced by an institutional maze that in effect creates 27 different digital economies. Where this leads to fragmentation and costly duplication, development capacity is constrained and consumers are losing out.

Today, however, a digital single market is about to become a reality for cross-border e-commerce, European services and digital content, with potentially massive benefits as a result (EITO 2010). Music downloads and access to music services are cases in point. Consumers often cannot find, or do not have access to, legal services and/or offers. This lack of supply may lead them to download illegally. One of our main goals is to enable people to purchase music online legally from another EU country just as easily as they would from a music shop in the physical world. This would generate new business opportunities for the creative and music industries and give consumers legal access to a wider range of music or films online. A series of different actions is proposed.

To open up access to legal online content, the European Commission has set itself an agenda that moves towards simplifying copyright clearance, management and cross-border licensing (Fig. 14.2).

Actions in this area include making electronic payments and invoicing easier, simplifying online dispute resolution and reviewing the EU data protection regulatory framework.

The Commission is also seeking to keep the Digital Agenda on track by establishing:

- A commissioners' group to ensure effective policy coordination
- A high-level group to work with member states
- Regular dialogue with European parliaments

As for specific deliverables, an annual scoreboard will be published each May. Meanwhile, a Digital Assembly will be held in June each year to look at what has been achieved and to examine whether there is a need to adjust the efforts to meet

Fig. 14.2 “Every European digital” *Source* Global Forum/Shaping the Future, WDC November 2010, Digital Agenda for Europe



new challenges. This process will take the shape of a dialogue involving member states, EU institutions, civil society and industry.⁵

The Commission has further committed itself to: promote the internationalisation of internet governance and global cooperation to maintain the stability of the internet on the basis of the multi-stakeholder model; support the continuation of the Internet Governance Forum beyond 2010; work with third countries to improve international trade conditions for digital goods and services, including with regard to intellectual property rights; and seek a mandate to update international agreements in line with technological progress or, where appropriate, propose new instruments (http://ec.europa.eu/information_society/digital-agenda/index_en.htm).

14.5 Related Factors

Realising the Digital Agenda, for the EU and for other regions, and fulfilling its potential, will hinge on a number of related factors. Some of these have to do with the availability of sufficient resources or infrastructure. Others will relate to the ability of stakeholders to discern and realise opportunities of various kinds. Of some particular interest in this context are the opportunities raised by open source.

Open source promises benefits including lower cost, better quality, higher reliability, more flexibility and an end to the predatory practices of individual vendors who will now be less likely to trap their partners and customers by dependency on specific technologies or services. This is because open source provides the opportunity for multiple non-incumbent and non-conventional organisations, people and talents to interact and create new and unexpected outcomes.

⁵ The first Digital Assembly took place on 16 and 17 June 2011.

Open source can be helpful to varying degrees with all the different applications of the digital society, including e-Government, e-education, e-Health, e-transportation, e-environment, green IT, etc.

Despite its potential, and the drive of many individual people to engage, experience shows that open source does not take off by itself. In particular, many emerging economies invest massively in encouraging the established ICT industry leaders to contribute their latest technology and software, and in training a wide range of officials. The goal for these economies is to leapfrog into the information society. While achieving rapid results in a number of respects, this strategy has the tendency to lead to an emphasis on business as usual, on routine applications, and on dependency on the established international industry, rather than to foster new innovative local competencies and firms.

In this context, open source can be highly important, not only as a means of reducing vendor dependency and improving the bargaining power of local players, but for introducing a “can-do” mindset and promoting innovation and the ability to integrate new kinds of tools. Lack of domestic experience and expertise is still often put forward as an impediment and reason to wait. Examples from various regions demonstrate that the difficulties can be overcome. Brazil, for instance, has made significant progress and cut costs by overtly pushing open source. For several reasons, collaboration between networks of researchers in different regions, such as the EU and the GCC, could also start initiating new thinking and demonstrating new openings in this respect.

Open source may indeed represent a practically useful hook for working out new means for productive regional collaboration, particularly among GCC countries. This is because all actors are in a learning mood, which is a constant feature of open source. Open source can be of special interest to the GCC, together with the EU, as a vehicle for building new relations between actors that are genuinely keen to share information and engage in mutual learning processes.

14.6 Issues Requiring Action

The Digital Agenda (European Commission 2010b), in conjunction with the Europe 2020 Strategy, aims to:

...Deliver sustainable economic and social benefits from a digital single market based on fast and ultra-fast Internet and interoperable applications.

However, the progress of different actions will strongly depend on their ability to overcome a number of specific issues. The most important of these are described below.

14.6.1 Increasing Trust

Public attitudes are crucial to the kind of progress that is possible with regard to the information society. Here, trust is now one of the critical factors. For example, 88 % of EU eShoppers reportedly feel a lack of trust today (Reding 2010).⁶

This kind of sentiment is no coincidence. Issues relating to security, integrity, authentication and the like present real issues in the information era. Conspicuous threats such as spam, malicious software, online fraud, identity threat and so on, unsettle consumers and dog efforts to promote the online economy.

The Digital Agenda offers a new avenue towards developing a range of practical solutions to counter these threats. Appropriate responses to cyber attacks and the adoption of tougher rules on personal data protection must be coordinated within Europe as well as beyond. This agenda is important for fulfilling the potential of IT services broadly, and developing the solutions that are required offers a range of business opportunities of its own.

14.6.2 Developing Ultra-High Speed and Wireless Broadband

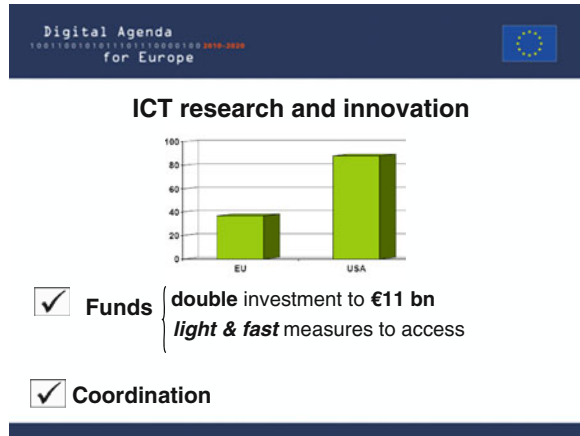
The scope for progress is dependent on basic capacity, which in turn needs to be put in place by governments (though private business and individuals need to generate the lion's share of innovations and practical applications themselves). Europe has made great progress in the first generation of broadband and mobile take-up, basically leading the world in this area, but is clearly falling behind on the new challenges, such as ultra-high-speed and wireless broadband. This is a great concern because major benefits await the leaders in these areas, especially when it comes to front-runner applications.

New services such as high-definition television or videoconferencing require much faster Internet access than is generally available in Europe. Higher speeds are needed to match world leaders like South Korea and Japan. By 2013, all EU citizens should have access to a basic internet connection. In ten years time, everyone should have access to speeds of 30 Mbps or more and half of Europe's households should have access to speeds of 100 Mbps or more.

The Digital Agenda aims to turn this ambition into reality, for instance by stimulating investment and developing a comprehensive radio spectrum plan.

⁶ From the speech by Viviane Reding, Vice-President of the European Commission responsible for Justice, Fundamental Rights and Citizenship, entitled *Building Citizen's Rights into the Single Market*, delivered at the 2nd Consumer Rights Forum 2010, Brussels, on 2 June 2010, http://ec.europa.eu/commission_2010-2014/reding/pdf/speeches/consumers_en.pdf.

Fig. 14.3 Total ICT R&D Spending (in billion €), 2007.
Source Eurostat and IPTS-JRC



14.6.3 Investing

The EU is under-investing in ICT research and development, as seen in Fig. 14.3. EU investment in ICT research is currently less than half of the amount being spent by the US.

World class infrastructure and adequate funding are required to attract the best minds to research in this field. Concrete steps that have been recommended to reach the 3 % target on R&D expenditures tend to focus on practical actions to channel more private sector investment into ICT research and innovation.

The Digital Agenda seeks to maintain Europe's competitive edge through increased coordination of and focus on Europe's fragmented efforts.

The first necessity is to ensure that adequate funding is available and accessible. The following steps have been proposed and should help lead forward:

- Leveraging more private investment through the strategic use of pre-commercial procurement and public-private partnerships, by using structural funds
- Adopting measures for "light and fast" access to EU research funds in ICT, making them more attractive notably to SMEs and young researchers
- Second necessity of coordination—to improve the ability of actors to collaborate in making use of the funds, for instance by reinforcing the coordination and pooling of resources with industry

14.6.4 Increasing Regular Use of the Internet

The European strategy aims to raise regular Internet use from 60–75 %, and from 41–60 % for disadvantaged people by 2015 (150 million Europeans have never used the internet!).

The Digital Agenda also aims to help people acquire the skills they need to use the internet proficiently. This will both improve the basic digital literacy of all EU citizens and address professional skills shortages, helping Europeans to participate fully in the digital society, fill jobs in a dynamic tech sector and promote employment growth throughout the economy.

For people already using ICT skills and working in the technology sector, the Digital Agenda will help identify and recognise the competencies of IT practitioners through an EU-wide certificate for e-skills based on the Europass CV classification (a common and agreed tool across Europe).

14.6.5 Developing Education

ICT has become a great force for transforming social, economic and political life globally. It has the potential to aid economic growth and improve social conditions.

For this to happen, it is important to create the appropriate infrastructures, offer reasonable connection costs and develop all citizens' computer literacy and numerical skills.

There is a strong link between modernising a country and the education required to raise the level of IT literacy within the working population.

14.6.6 Developing e-Government Services

eGovernment services have to be led by the ambition to be really interesting to citizens and businesses. At present, 38 % of citizens use online services; the target is to raise this figure to 50 % (with more than half of those returning filled-in forms online). Member states need to agree on a list of publicly available cross-border services by 2011. These services must be available in all member states no later than 2015.

14.6.7 Developing Health Care

Health care is also an important part of digital services; investing more in eHealth can dramatically improve the range and quality of care available. Telemedicine and portable devices can offer a revolution in patient freedom of movement while saving everyone money.

By 2015, the Digital Agenda wants to provide Europeans with secure access to their online medical health records, not just at home but also when they are travelling anywhere in the EU. This would facilitate the work of doctors and enable patients to get the best help if they are seeing a doctor at home or in another EU country.

14.6.8 Developing Media Labs

Media labs can play a catalytic and essential role in fulfilling the potential of the Digital Society. They are laboratories of architecture and planning devoted to research projects at the convergence of design, multimedia and technology.

Media labs have been widely popularised since the 1990 s by business and technology publications such as *Wired* and *Red Herring* for a series of practical inventions in the fields of wireless networks, field sensing, Web browsers and the World Wide Web.

More recently they have focused on design and technologies that address social causes. One Laptop per Child (OLPC) was one of the notable research projects that grew out of the MIT Media Lab.

Media labs help both technologically savvy and technologically challenged researchers with their creation of powerful computerised experiments. Created specifically for the Windows environment, media labs combine smart experimental design features with the capabilities of today's powerful multimedia PC technology.

Media labs allow an abundance of stimuli from basic and fully-formatted Word documents, HTML and PowerPoint presentations to be transferred to multimedia files such as audio, video and image files—either alone or in combination. Examples include:

- The CUBE in Issy-les-Moulineaux, France
- The Media Lab Helsinki and many others in Europe
- Developing smart cities and regions through living labs centred on media and content, i.e. media labs.

Following significant support from the European Commission, living labs have proved to be an effective way to close the gap between innovative R&D and market take-up and to make the innovation process more efficient.

Networks such as the European Network of Living Labs (ENoLL) and projects like Apollon, a Commission-funded initiative to benchmark and share best practice across European living labs have, in turn, helped to mainstream this new and important means of innovating.

14.6.9 Developing S&T Parks

The development of science and technology (S&T) parks and, in some instances, specialised ICT parks can help to establish a critical mass of competencies and resources in a particular area. Such parks may make it possible to enhance the technological skills and knowledge access of a particular region and lay the basis both for attracting a more mature technology industry and for creating technology-intensive start-up companies. Hence, the parks contribute to the overall development of ICT in their regions.

ICT parks enable the creation of a dynamic environment in which local talents can be attracted, retained, incubated, cultivated and shared. They should operate along the full ICT value chain, from ideation to commercialisation. They need also to be integrated with the wider economic forces in their countries, including government, industry and educational institutions.

S&T and ICT parks can be laboratories of good practice for GCC countries and a source of efficient implementation cooperation between the EU and GCC.

14.7 Concluding Remarks

ICT has already achieved an information revolution, both at the global level and in many individual countries worldwide. The continuing advance of ICT will continue to have a dramatic impact on growth, jobs and prosperity.

According to one study, for every job lost because of the internet, another 2.6 jobs were created. Especially SMEs enjoy plenty of opportunities to achieve greater reach and stronger productivity growth (McKinsey Global Institute 2011). The GCC countries are among those investing for the future in this area and primed to take advantage of the opportunities that arise. Economic integration partly spurred by more effective ICT cooperation can further leverage the potential benefits to the GCC's maturing common market of 30 million potential customers. However, hurdles do exist. There is a distinct need for the GCC countries to embark on practically useful collaboration projects, of a nature that can help identify and demonstrate avenues for achieving success in capturing opportunities to generate new products, enterprises and jobs.

New horizons evolving due to convergence and cloud computing offer a rich array of opportunities for countries all around the world, while cutting across traditional sectoral as well as national boundaries. For the GCC, the key will be an ability to engage in new cooperation and partnerships. This must be predicated on an IT approach that is conducive to new applications in areas such as e-health, e-education, green IT, etc.

Like their EU counterparts, the GCC countries are heterogeneous yet represent a wider community that stands to benefit from further pooling of resources and common strategic initiatives (both at intra-GCC level and through collaborative projects with the EU). The mix of rapidly evolving opportunities and challenges emerging through convergence and cloud computing should be built upon to inspire new and stronger research networks and projects across national and sectoral borders. One concrete possibility would be to create joint EU-GCC networks for young researchers, inviting participants from across a range of relevant cross-disciplinary issues of relevance to both regions.

The most important challenges remain ahead. The information society can fulfil its promise of enabling a better future only when coupled with a vision of constructive, global cooperation.