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Ubiquitous Developments of the Digital Single Market

STUDY

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Abstract

Ubiquitous solutions providing access from anywhere at any time are a next step for government and commercial services, and are expected to result in lower costs, increased flexibility, and an enhanced user experience. These solutions, based on modern cloud technologies, may facilitate re-use across borders, avoid duplication and achieve scale economics as well as cross-border interoperability for e-government services.

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LIST OF ABBREVIATIONS

ADR	Alternative Dispute Resolution
ADSL	Asymmetric Digital Subscriber Line
ANPR	Automated Number Plate Recognition
API	Application Program Interface
BcN	Broadband convergence Network
CCTV	Closed-Circuit TeleVision
CDMA	Code Division Multiple Access
CEF	Connecting Europe Facility
CIP	Competitiveness and Innovation Programme
DAE	Digital Agenda for Europe
DDoS	Distributed Denial-of-Service
DSL	Digital Subscriber Line
EDI	Electronic Data Interchange
EEA	European Economic Area
EIF	European Interoperability Framework
EIS	European Interoperability Strategy
ESO	European Standardisation Organisation
FTTC	Fibre to the Curb
FTTH	Fibre to the Home
FTTP	Fibre to the Premises
FP	Framework Programme
Gbps	Gigabyte per second

GPS	Global Positioning System
HCP	Health Care Professionals
HTML	HyperText Markup Language
ICT	Information and Communication Technology
ID	Identity
IDABC	Interoperable Delivery of European eGovernment Services to public Administrations, Businesses and Citizens
IMCO	Internal Market and Consumer Protection
IoT	Internet of Things
IPR	Intellectual Property Rights
ISA	Interoperability Solutions for European Public Administrations
IT	Information technology
ITRE	Industry, Research and Energy
ITT	Invitation to Tender
LSP	Large Scale Pilot
LTE	Long Term Evolution
MASP	Multi-Annual Strategic Plan
Mbps	Megabyte per second
NFC	Near Field Communication
NGA	Next-Generation Acces
OECD	Organisation for Economic Co-operation and Development
ODR	Online Dispute Resolution
OJEU	Official Journal of the European Union
PDA	Personal Digital Assistant

PKI	Public Key Infrastructure
PPP	Public Private Partnership
QR	Quick Response
RFID	Radio Frequency Identification
SME	Small or Medium-sized Enterprise
SOAP	Simple Object Access Protocol
SSL	Secure Socket Layer
sTESTA	Secure TransEuropean Services for Telematics between Administrations
SWOT	Strenghts, Weaknesses, Opportunities, and Threats
UK	United Kingdom
UMTS	Universal Mobile Telecommunications System
UN	United Nations
US	United States
USN	Ubiquitous Sensor Network
VAT	Value Added Tax
VDSL	Very-high-bit-rate Digital Subcriber Line
VoIP	Voice over Internet Protocol
VULA	Virtual Unbundled Local Access
WCO	World Customs Organisation
WiBro	Wireless Broadband
WLAN	Wireless Local Area Network
XML	eXtensible Markup Language

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EXECUTIVE SUMMARY

Ubiquitous services can provide users with real-time access to desired information, from anywhere and at any time, significantly lowering transaction costs both for commercial and for e-government transactions. Key additional reasons to implement ubiquitous solutions are to improve access to information, and to give an economic boost by creating more innovation and new demand, hence growth.

In this study, we report on and evaluate the use of advanced ubiquitous services to provide e-government and commercial services in EU Member States and in other parts of the world. Objectives include (1) understanding global and European best practice, (2) seeing how Europe stacks up against global trading partners and competitors, and (3) exploring the degree to which ubiquitous solutions might be helpful in reinvigorating European e-government initiatives.

Ubiquitous services are mainly developed within Member States, which means that these efforts are usually not interoperable and cannot be directly accessed or implemented in other Member States. Some activities have been undertaken on the European level to coordinate these activities. One question at large is **whether similar e-government initiatives developed by Member States would be more effective if they would be coordinated across Europe**. By mapping existing e-government and commercial services, this study aims to provide insight into this issue.

Activities in non-EU countries

Governments around the world are heavily investing in building blocks for ubiquitous services (e.g. high speed broadband, sensor networks). The precise understanding of ubiquitous services differs across countries and regions (e.g. Asia and North America), but they have several elements in common, such as real-time and continuous access via several platforms to intelligent (e.g. based on context-aware data) services.

Global examples of best practice can be found in South Korea, Japan, the US, and Canada. South Korea's u-strategy aims to create a 'top level' u-infrastructure also offering services for mobile devices. The government is also implementing its Giga Korea plan (2013-2020) aiming to upgrade bandwidth to 10 Gbps for the fixed network and 1 Gbps for the mobile network. Japan's ubiquitous policies aim to use ICTs to cope with societal challenges, such as health care issues due to a rapidly aging society, environmental issues and energy shortage, and public safety. Central to the US strategy is 'government 2.0' focusing on transparency, participation, and collaboration. Canada's Federating Identity Management is seen as one central element towards achieving a citizen-centred service model.

Activities in EU Member States

Development of ubiquitous solutions, and especially of ubiquitous e-government solutions, within a number of frontrunner EU Member States is also quite impressive. 11 Out of the top 20 countries in the 2012 UN e-government index are EU Member States, and another 15 are mentioned as emerging leaders[1].

The e-Estonia strategy is based upon the assumption that successful introduction of e-services is built on a decentralised, distributed system in order for all components to be linked or added on a platform-independent basis. Ubiquitous solutions in Estonia cover a wide range of services. Central to the Netherlands' r i-NUP program are standardisation and interoperability of government registrations. Its Rijkscloud cloud computing system is

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[1] UN (2012) 'United Nations E-Government Survey 2012: E-Government for the People', New York: UN.

implemented separately from the internet. Germany has policy frameworks for e-government services in place at the federal, state, and local level. In the UK, budget cuts have forced the focus to shift to the deployment of broadband internet and the development of centralised portals. The G-Cloud and CloudStore focus on introducing cloud ICT services into government departments, local authorities and the wider public sector.

Cross-border operations in Europe, however, are limited or non-existent. The attempts that have been made at Europe-wide interoperability are all struggling.

Commercial services

Ubiquitous market solutions, as distinct from specifically e-government solutions, show different tendencies. These solutions tend to be globally available and globally interoperable; however, they tend to deal with much less specialised applications than does e-government. They include a wide range of services and platforms, including eCustoms services developed by SAP, the eBay market place, Microsoft's cloud services and Skype VoIP service, the Facebook Platform and Facebook Connect, a range of offerings from Google, and the Apple app store. The ubiquitous market solutions have been, with the exception of Skype and SAP, developed in the US.

Fixed and mobile broadband infrastructure

Much of our focus in this study is on ubiquitous applications, but many of the countries of interest, notably Japan and South Korea, have placed enormous emphasis on *ubiquitous access to applications*. Several non-EU Member States have substantially greater deployment and adoption of FTTP (fixed) and/or LTE (mobile) high bandwidth services than does any EU Member State. The limited availability of FTTP (mitigated by availability of cable in some Member States) presumably limits the commercial solutions that can be deployed, but probably has only limited adverse impact on ubiquitous e-government applications, which tend to require only moderate bandwidth. The relative lack of high speed LTE mobile broadband deployment in Europe, however, clearly limits the ability to access these services from anywhere, and at any time.

The Opportunity For Coordinated Policy At European Level

Europe is not an intrinsically weak player as regards the implementation of ubiquitous e-government services. Indeed, the performance of front-runner European Member States in terms of development and deployment of ubiquitous e-governments ranks among the best in the world[2]. *What has conspicuously languished is the development of cross-border* interoperable e-government services.

There does not appear to be a substantial shortage of programmes or action lines at European level; moreover, many of them appear to be directionally appropriate. For nearly every need that we have identified, some action line already exists, albeit mostly in the realm of soft law and non-binding obligations or fragmented implementation across the EU. Our concern is thus not with a lack of programmatic response; rather, it is that *the action lines in place individually and collectively do not appear to be having much effect on the problem*.

With regard to commercial services, the main concern is to create a legal framework enabling their unfragmented development and access within the Digital Single Market, as well as to identify areas where they could have synergies with ubiquitous government services (e.g. interoperability of private supply chain IT platforms and compliance tools with public customs and VAT reporting systems).

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[2]   UN, 2012.

When *it comes to cross-border interoperability of e-government solutions, Europe continues to face enormous challenges. These challenges are largely unique to Europe, which is effectively a confederation of 28 Member States. The solution cannot be purely technical; moreover, it will not be found solely by studying ubiquitous non-EU e-government solutions that address only the needs of a single homogeneous country.*

Areas most amenable to coordination at European level

We have identified a number of areas that appear to deserve particular attention regarding EU level coordination:

- Identification (e-ID), authentication, and authorisation schemes;
- The European Interoperability Framework (EIF) and related activities;
- eHealth, including (1) exchange of patient data and (2) ePharmacy;
- e-VAT;
- e-Customs.

Furthermore, *any other policy pursued on the European level would merit from a close examination of benefits that could be derived from ubiquitous solutions. A detailed analysis of costs and benefits needs to be performed on a case by case basis.*

Recommendations

Our recommendations fall broadly into two areas: (1) ensuring ubiquitous access to commercial and e-government services, and (2) strengthening cross-border interoperability of ubiquitous e-government services.

The need and desirability of achieving the benefits of ubiquitous commercial and e-government services provides yet another reason why continued attention to the deployment and adoption of fixed broadband appears to be justified.

> **Recommendation 1:** The promotion of widespread deployment and adoption of basic and ultra-fast broadband in Europe continues to be desirable

A central theme of the Digital Agenda for Europe relates to the availability and speed of broadband services available to Europeans, but *there is no explicit goal in regard to the availability or take-up of specifically mobile services.* The DAE also fails to identify what is meant by those speeds (guaranteed speed, advertised speed, one way or two way, and so on). Were Europe to adopt mobile broadband goals, they should be better specified.

> **Recommendation 2:** Consideration is needed for an explicit European goal to promote mobile broadband. This could be a candidate for an expansion to the Digital Agenda for Europe. If undertaken, a mobile broadband objective should be defined more fully than the overall broadband goals are described today

The challenges of achieving cross-border integration of European services cannot be solved by technology alone. It is necessary to first understand and subsequently address semantic differences, legal impediments, and organisational challenges. Furthermore, there is no shortage of policy instruments, and the objectives of most of the existing policy instruments appear to be sensible and appropriate. Nonetheless, it is hard to identify a single programme in the entire European e-government policy space that is delivering the results that could be hoped for.

Recommendation 3: A frank acknowledgment is needed that overall progress on the deployment of interoperable cross-border e-government services is making scant progress. This must be addressed as a systemic failure, not as a series of isolated problems.

A coordinated approach to understanding the underlying problems is needed. Properly understanding the problems in any of these domains requires specialised domain-specific subject matter knowledge. We believe that a group of studies, coordinated in terms of scope, delivery dates and general terms of reference, may likely yield useful results.

Recommendation 4: We see the need for a coordinated barrage of studies to simultaneously understand, in several prominent domains, what would be required to accelerate progress on achieving interoperable cross-border e-government services.

The substantial de-funding of the Connecting Europe Facility has not only impacted broadband deployment, but has also had the unfortunate and perhaps unintended consequence of undermining efforts to accelerate the move to interoperable cross-border e-government services.

Recommendation 5: Explore alternative means to fund interoperable cross-border e-government services.

It is likely that each ongoing activity will require a different constellation of corrective measures. Nonetheless, but we put forward the view that existing efforts are in the right direction but are insufficiently ambitious in terms of concrete steps and even concrete planning.

Recommendation 6: The already committed deliverables of the Commission and the eHealth Network for 2014 and 2015 should be expanded to include concrete planning with specific dates and commitments to eventual operational systems.

We identified a number of additional areas as being good candidates for a more activist policy. Detailed evaluation of these areas is well outside the scope of this study, but we would nonetheless venture some tentative recommendations as a starting point for discussion.

Recommendation 7: For e-ID, authorisation, authentication, and the overall European Interoperability Framework (EIF), planning to 2015 and beyond needs to go beyond dialogue and consciousness-raising. Planning needs to include operational deliverables, not just discussion papers.

The focus today should in our view be on functional interoperable middleware – actual interoperable, reusable software code with well-defined Application Program Interfaces (APIs), and with defined communication protocol interfaces between systems where appropriate. These should draw on existing commercial solutions where appropriate

Other e-government middleware could be considered to support other processing activities that are likely to be common to multiple e-government applications. For instance, middleware support might be warranted for ePayment and other online transaction services that would make it easier to comply with applicable tax, reporting and financial service regulation requirements.

Recommendation 8: Member States should be required to consider the use of reusable EIF modules wherever appropriate once the modules are available and sufficiently reliable.

In the absence of an obligation at European level, Member States are likely to make only limited use of reusable, interoperable EIF middleware modules. The benefits of interoperability are far greater to Europe as a whole than to individual Member States.

Recommendation 9: For e-Customs and e-VAT, the delayed implementation programmes need to be analysed, and need to be either corrected or replaced promptly.

Other policy areas pursued on the European level would profit from a close examination of benefits that could be derived from ubiquitous solutions since such solutions require and lead to better coordination of e-government services, as well as to an improved and unfragmented access to them. This is reflected in expectations of EU citizens and businesses in such areas as emergency services, employment, vocational training and education, public procurement, registers.

Recommendation 10: A detailed analysis of costs and benefits needs to be performed on a case by case basis for other policy areas that may be amenable to coordinated action on the European level..

Commercial services should in our view be considered where application requirements permit, and especially in cases where the application exists primarily to make public data available to the public.

Recommendation 10: Member States should consider commercial ubiquitous application solutions such as cloud services on a case by case basis for e-government services, even though their scope is likely be limited.

1. INTRODUCTION

KEY FINDINGS

- Ubiquitous solutions are defined as intelligent services providing users with real-time access to desired information, from anywhere and at any time, significantly lowering transaction costs both for market and government transactions. Services and solutions that are not explicitly called 'ubiquitous', but can be considered as such based on this definition are also included in this study.

- Key functions of ubiquitous solutions are to improve access to information, lower transaction costs, and give an economic boost by creating more innovation and new demand, hence growth. Furthermore, ubiquitous solutions can introduce more efficient modes of providing services, and may improve access to administrative information, lead to better administrative cooperation, better compliance schemes and hence better predictability and lower transaction costs for companies and administrations alike, in a variety of areas such as customs, VAT, public procurement, accounting, auditing, and market intervention.

- With reference to government services, ubiquity can be conceived as a multi-criteria 'score' the range of information or services available, the degree to which individuals and organisations have access, and the technologies, infrastructures and interfaces through which such access can be obtained.

- Ubiquitous developments can be described using three dimensions: their policy objectives related to access to information or lowering transaction costs, their technological characteristics related to the integration of (mobile) platforms, cloud computing and sensor technology (Internet of Things) and their capabilities for service delivery such as online, real-time, automated and personalised access.

- While ubiquitous services can be seen as an evolution from traditional (physical), electronic and mobile services, they are more likely to coexist in parallel with these types of services rather than replacing them. Characteristics that are typically associated with ubiquitous solutions (as opposed to electronic services) are a common, underlying technology, centralised development and interoperable services.

1.1. Context

New developments and exogenous changes in technology, methodologies, markets, business, and government models (e.g. the Internet of Things[3], cloud computing)[4] are creating a demand for and possibly a supply of the essential components of ubiquitous markets and ubiquitous governance. This leads in turn to new services for government, business and society. Central to this development is the shift from *electronic* services and solutions to *ubiquitous* services and solutions. This shift can be seen as a change in *capabilities* (potential supply) accompanied by a change in *requirements* (part of potential demand).

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[3] The evolvement "from a network of interconnected computers to a network of interconnected objects, from books to cars, from electrical appliances to food, and thus create an Internet of Things (IoT)", European Commission (2009b) 'Internet of Things – Action Plan', COM(2009) 278 final, Brussels, 18 June, p. 2.

[4] Civic Consulting (2012) 'Cloud Computing', Study for the European Parliament's IMCO Committee, http://www.europarl.europa.eu/committees/en/imco/studiesdownload.html?languageDocument=EN&file=7341 1.

Key functions of ubiquitous solutions are to improve access to information, lower transaction costs, and give an economic boost by creating more innovation and new demand, hence growth. Furthermore, ubiquitous solutions can introduce more efficient modes of providing services, and may improve access to administrative information, lead to better administrative cooperation, better compliance schemes and hence better predictability and lower transaction costs for companies and administrations alike, in a variety of areas such as customs, VAT, public procurement, accounting, auditing, and market intervention.

1.2.   Defining ubiquitous

In common parlance, ubiquity, or omnipresence, refers to things (services, characteristics) that are evident, present or accessible by anybody, using any device or system, from anywhere and at any time. This is a very broad definition, and may exclude many developments and policies that otherwise increase the availability of information or services – for example, those that make some services or information (but not all) available to eligible parties (again, not all) from all locations where they might be needed. Therefore, this study seeks to develop a working definition of ubiquitous that fits the purpose of this study and helps to identify existing solutions, even if they are not specifically called ubiquitous.

In relation to computing, the notion of ubiquity has been defined as "the method of enhancing computer use by making many computers available throughout the physical environment, but making them effectively invisible to the user"[5]. The definition provided by the IMCO Committee[6] focuses on web-based services and solutions for provisioning, gathering, and processing of data via multiple platforms and devices that lower transaction costs.

Adapting the definition from the Specifications by including elements from a definition from literature, we define ubiquity in this study as "**intelligent and interactive services providing users with real-time access to desired information and the possibility to input information where and when appropriate, from anywhere and at any time**"[7], "significantly lowering transaction costs both for market and government transactions[8]." This definition is used in subsequent chapters both to select initiatives and practices and to provide a basis for comparing 'pro-ubiquity' policies and developments even when they do not seek to promote ubiquity, let alone agree on what it means. Ultimately, this identification of interesting policies and practices permits comparison and analysis of the potential impact of implementation of ubiquitous governance in specific areas.

In the area of public services, the notion of ubiquitous can also be seen to evolve from electronic services. A recent OECD report defines ubiquity in the context of government services as follows: "The wider meaning of ubiquitous government – u-government – services can be interpreted as advanced social infrastructure for future society. Technology is often a few steps ahead of the socio-economic and usability enablers necessary to make

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[5]   Weiser, M. (1993) 'Some Computer Science Issues in Ubiquitous Computing', Communications of the ACM 36(7), p. 75.

[6]   Specifications for a research study on "New Developments of the Digital Single Market", March 20 2013: "Ubiquitous means web based, with automated gathering and dispatching of data, available real-time through various platforms, including mobile, both for feeding and reading information, with access based on e-identity and authentication, with transactions possible anytime, everywhere and on any device. In ubiquitous systems information is gathered automatically and then dispatched for processing, giving a user direct access to information or content or providing the user with outcomes rather than raw data, significantly lowering transaction costs both for market and governance transactions."

[7]   Uhm, O.-S. (2010) 'Introduction of m-government and IT convergence technology', KAIST institute for IT convergence, http://www.dti.gov.ph/uploads/DownloadableForms/Pages%20from%20ECO_[1]%20Introduction%20of%20m-government%20and%20IT%20convergence%20technology-KAIST-Uhm%20Ouisuk_15Apr10.pdf.

[8]   Specifications, 2013.

the transition. The stakeholders are working in various collaborative contexts to implement the paradigm of "anywhere, anytime, anyhow access to any service by anybody" which is bases on the W3C device independence principles"[9]. This same report sees u-services as a next step in the development of service concepts[10], as is shown in Table 1.

Table 1: **The evolution of the implementation of IT services**

	Concept	Tools
Traditional services	A series of activities and processes transforming products and information into a new state desired by the customer, with the participation of the customer, and the results achieved by such activities and	Face-to-face contact Human delivered services
E-services	Electronic services, enabled by the internet or other information networks, enhancing the efficiency of internal processes within business organisations and that of customer support processes.	Value-added networks Internet Personal computers
M-services	Delivery of e-services to mobile devices, eliminating access restrictions.	CDMA Mobile handsets PDAs
U-services	Intelligent services providing users with real-time access to desired information, from anywhere and at any time.	WiBro RFID USN Portable devices

Source: OECD (2012b) 'M-government: mobile technologies for responsive governments and connected societies', p. 62, http://www.itu.int/pub/D-STR-GOV.M_GOV-2011.

Therefore, with reference to government actions (amounting in most cases to providing information and/or services), ubiquity can be conceived as a multi-criteria 'score' reflecting:

- The range of information or services available;

- The individuals and organisations able to gain access or benefit;

- The locations and circumstances (including time and eligibility conditions) controlling that access;

- The support (e.g. in the form of 'system intelligence' or 'smart functionality') provided to facilitate and optimise such access;

- The technologies, infrastuctures and interfaces through which such access can be obtained; and

- The efforts that potential beneficiaries must make to discover, obtain and make use of the information and services.

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[9] OECD (2012b) 'M-government: mobile technologies for responsive governments and connected societies', p. 62, http://www.itu.int/pub/D-STR-GOV.M_GOV-2011.

[10] Uhm, 2010.

To permit analysis and classification of pro-ubiquity developments across a range of contexts and areas, we can extend this characterisation to encompass the following dimensions and their characteristics (see Table 2). These dimensions are also used to describe the different ubiquitous solutions in Chapter 2 and 3.

Table 2:   Dimensions of ubiquitous solutions

Dimensions	Characteristics
Policy objectives	Access to information, lowering transaction costs, transparency
Technological aspects	(Mobile) platforms, sensor technology, Internet of Things
Characteristics of services (including access to information)	Online, real-time, mobile, personalised, automated

When investigating ubiquitous solutions, some considerations:

- There is a strong link between ubiquitous services and sensor networks (and the internet of things). This sets u-services apart from e-services or m-services.

- Ubiquitous initiatives are not necessarily the next evolutionary step of existing e-services or m-services. In reality, different levels of services might exist in parallel.

- Not all ubiquitous solutions are commonly referred to as ubiquitous. We investigate both developments that are called ubiquitous and those that have the characteristics of ubiquity but may not be commonly thought of as being ubiquitous.

- Ubiquitous developments not only serve citizens and businesses, but can also serve government organisations. The scope of this study is shown in Figure 1.

Taking into account the definition of ubiquity used in this study, the aspects of the ubiquity 'score' and the three dimensions used to investigate ubiquitous solutions, three characteristics seem to be typically associated with them (as opposed to electronic services). These characteristics are are a common, underlying technology, facilitating access, centralised development to allow for coordination and overcome duplication, and interoperable services to lower transaction costs and create transparency.

Figure 1:   The scope of this study
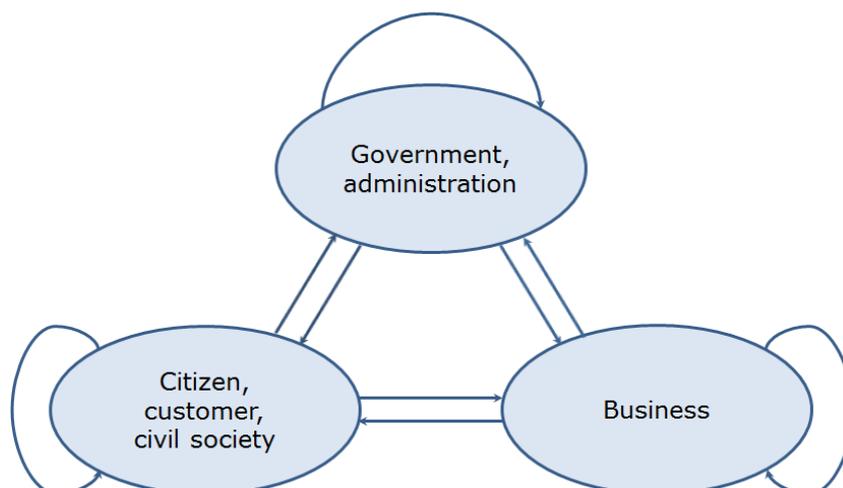
1.3.   Methodology and outline of the report

This study consists of two parts: an inventory of existing ubiquitous solutions, governance and markets, within and outside the EU, and an analysis of the ubiquitous solutions identified.

The first part, our empirical analysis, is based on a 'catalogue raisonné' of best practices, or vignettes. These vignettes are studies of products and services versus market and service models, structures and applications in different countries. Rather than a mere description of the ubiquitous solution in a certain area, or market, the policy context is also described inasmuch as the development of services can hardly be seen considered separately from their context.

For the description and the analysis of the vignettes and the solutions, we use a common framework, including elements such as the policy objective of a solution and the stakeholders involved, the technological elements or enablers, and the goal of a solution as well as its use, the costs involved and the effects (both positive and negative). By investigating the vignettes (especially the ones that are EU-based), we applied the definition presented in Section 1.2. Therefore, we also took into account solutions that are not explicitly called 'ubiquitous', but can be considered ubiquitous based on our definition.

The inventory of existing ubiquitous solutions is divided into three parts: developments in non-EU jurisdictions (Chapter 2), within EU Member States (Chapter 3), and ubiquitous market solutions (Chapter 4). The non-EU jurisdictions we investigate are South Korea, Japan, US, and Canada. The four European Member States we included in our study are Estonia, U.K., the Netherlands, and Germany. The selection of these jurisdictions was made by first identifying front-runner countries that can serve as an example for others (such as South Korea). Subsequently, we also provide an overview several of ubiquitous market solutions, including (often US-based) developments set up by SAP, eBay, Microsoft, Skype, Facebook, Google and Apple. We conclude in Chapter 5 with a disussion of fixed and mobile broadband access to ubiquitous commercial and e-government services, a topic which is somewhat distinct from that of the applications themselves.

In the second part of the study, we use the evidence base developed in the first part to consider what actions, if any, are appropriate at European level. This second part consists of an analysis of the options for EU level coordination (Chapter 6), areas amenable for

coordination (Chapter 7), and an impact assessment of the potential EU level actions (Chapter 8). Finally, conclusions and recommendations are presented (Chapter 9).

The terms of reference for the study call on us to consider the costs and benefits of the current and future evolution of ubiquitous markets and ubiquitous governance under current arrangements (where only limited instruments exist to coordinate relevant policy at European level) with alternatives where the Union might play a more active coordinating role. This effectively asks us to identify a range of options for potential policy interventions at European level, and to assess relative costs and benefits associated with each. We provided an informal impact assessment, broadly following the Commission's 2009 Guidelines, as a structured means of conducting the analysis. It is a tool that is well suited to the task that we were asked to perform, and provides results in a form that is familiar to the Parliament.

We were also called on to identify (1) areas that are most susceptible to benefit from coordination at European level, and (2) to identify any precautions that might be necessary to avoid disruptions to those areas. The former appears in Section 6.1, based on a comparative assessment of national approaches that appears in Annex 1; the latter appears in Section 6.2 (which, however, should be understood together with our overall recommendations as they appear in Chapters 8 and 9).

2. UBIQUITOUS SOLUTIONS IN NON-EU JURISDICTIONS

KEY FINDINGS

- Governments around the world are heavily investing in building blocks for ubiquitous services (e.g. high speed broadband, sensor networks). The precise understanding of ubiquitous services differs across countries and regions (e.g. Asia and North America), but they have several elements in common, such as real-time and continuous access via several platforms to intelligent (e.g. based on context-aware data) services.

- South Korea's u-strategy aimed to create the 'world's best u-society', based on an anytime/anyplace connection. The plan focused on creating a 'top level' u-infrastructure also aimed at offering services for mobile devices. This includes bringing 50-100 Mbps to 95% of the 20 million Korean households. In 2010, the government set up its Smart Korea IT Plan, aimed at convergence and enhancing the infrastructure that has been laid out.

- The Smart Korea program focuses on connecting the physical infrastructure, including broadband internet and RFID technology with different types of devices, software, platforms and network technologies, developing ubiquitous services. The integration of resources within government is to save costs of system construction by 52%. Currently, the government is also implementing its Giga Korea plan (2013-2020) aiming to upgrade bandwidth yet again to 10 Gbps for the fixed network and 1 Gbps for the mobile network.

- In the Korean context, the notion of ubiquity is largely implemented on the local level, in the many u-City projects. A u-City is a "city fully equipped with networks through which authorities can monitor almost everything that is happening in the city and take necessary measures on the spot, and residents can have access to necessary information and services for their daily lives".

- Korean u-services include customised services portals for citizens (Korea e-Government Portal, www.korea.go.kr) and integrated services for businesses (Government for Business Portal, www.g4b.go.kr), an e-people portal for digital complaints and initiatives, electronic procurement, e-learning, and e-Customs/u-Port systems. As South Korea pushes hard to achieve ubiquitous services in all areas, this has earned the county the first ranking in the UN e-government benchmarks of 2010 and 2012.

- Japan's ubiquitous policies aim to use ICTs to cope with challenges, such as health care issues due to a rapidly aging society, environmental issues and energy shortage, and public safety. Measures of success include 80% of the population to feel comfortable using ICTs and appreciate the benefits of ICTs in resolving social problems through social reform and human development. Services provided in Japan include e-Health services, e-Learning initiatives, e-Tax and e-Customs services, and smart city projects.

- The whitepaper on Information and Communications in Japan from 2004 stated: "A ubiquitous networked society is becoming a reality in which anyone with any device at any time from any place can access a network and freely exchange information." The Japanese Ministry of Internal Affairs and Communications (MIC) started a study on ubiquitous networking around 2000 and in 2002 issued a report on 'Ubiquitous Networking'. It argued that the context aware computing environments embedded in our real world interconnected by broadband fixed/mobile networks will greatly enhance services to end users and bring convenience and security to all people.

- Central to the US strategy is 'government 2.0' focusing on transparency, participation, and collaboration. For example, a general ubiquitous strategy is pursued by the website USA.gov. Furthermore, a great number of initiatives exist that serve as meta-websites providing an overview of existing services via plattforms, such as data.gov and healthcare.gov. These initiatives often involve government-citizen interaction through social media.

- In Canada, no national e-government policy framework exists. Federating Identity Management is seen as one central element towards achieving a citizen-centered service model. Another aim is to foster the use of cloud technology in government services to make them ubiquitously accessable and to achieve more efficiency in the provision of government services. As is the case in the US, many initiatives exist on the agency or local (state, province or town) level.

- Where South Korea and Japan are predominantly investing in the development of advanced infrastructures (e.g. broadband convergence networks, sensor networks), the investments of the US and Canada seem to be more dispersed and cover all kind of initiatives ranging from the opening up of government data to government-citizen interaction through social media.

- In South Korea and Japan, policy initiatives and service development are strongly driven by the central government, often forging public private partnerships, in the US and Canada this often takes place at the level of the state or local government, stimulating private initiatives.

2.1. Introduction

Governments around the world are heavily investing in building blocks for ubiquitous services (e.g. high speed broadband, sensor networks). They do this because they expect that ubiquitous solutions will contribute to the achieving of all kinds of goals, ranging from boosting innovation (e.g. development of new services) to the improvement of quality of life (e.g. continuous and smart health monitoring of patients). The precise understanding of ubiquitous services differs across countries and regions (e.g. Asia and North America), but they have several elements in common, such as real-time and continuous access via several platforms to intelligent (e.g. based on context-aware data) services. For the EU, it is interesting to understand what these ubiquitous solutions are, what the (estimated) costs and benefits of these policies and services are, and what the EU could learn from these policies and projects.

To explore a great diversity of possible impacts of ubiquitous solutions, we include countries in Asia (South Korea and Japan) and North America (US Canada) in our study. The Asian countries were selected because they are front-runners in providing ubiquitous solutions, while the North American countries were included in this study to show what is happening in those juridictions.

In this chapter, we first discuss the policy objectives of the countries under study. Then we investigate technological considerations and finally we describe specific services on offer. After these services are described, they are mapped according to the sector in which they have been developed, and their characteristics are compared. The comparison of the countries' policies and projects is cross-analysed, and the most important lessons deriving from the analysis are described.

South Korea

Policy objectives

South Korea's uSociety strategy follows a series of national IT plans developed by the central government since 1987 (see Table 3). These plans regard IT as part of economic policy, and its goals are mainly formulated in terms of economic growth and societal gains, such as (regional) economic growth and overcoming (youth) unemployment[11]. Goals of Korea's e-government policy (2002-2006) include, for example, a 90% internet penetration rate, the establishment of e-education at schools, and the provisioning of free internet access at community centers in low income areas and in remote areas. Furthermore, increasing the international competitiveness of the Korean economy and the Korean IT industry becoming a world leader are a major goals[12].

Table 3:   Korean u-Society policies

Year	Name	Policy objectives
1987- 1996	National Basic Information Systems Plan	Computerisation of national data in areas such as resident registration, real-estate registration, and finance
1996 - 2005	Comprehensive Plan for Constructrion of a Korean Information Infrastructure	Building a nationwide optical network and a high-speed transmission network
2002 - 2006	e-Korea policy	Inplementation of the Electronic Government Act of 2001, which aims to build the foundation for e-government and implements 11 national initiatives
2006 - 2010	u-Korea policy	Applying new information technologies such as RFID and USN to public services in the wake of convergence of information/communications technologies and diffusion of ubiquitous technologies
2011 – 2014/ 2015	Smart Korea policy	Follow-up to u-Korea aiming for the implementation of u-services
2013 - 2020	Giga Korea policy	Introduction of even faster broadband technology

Source: Ministry of Public Administration and Security (MOPAS) & National Information Society Agency (NIA), 'Digital society development in South Korea', http://unpan1.un.org/intradoc/groups/public/documents/un-dpadm/unpan042711.pdf; Jeong, K.-H., Moon, J.-W. & Sepulveda, E. (2011) 'Country Case Study: Korea', ADB/ITU Workshop for Rural ICT Project, 30 June, http://www.itu.int/ITU-D/asp/CMS/Events/2011/ITU-ADB/FinalWorkshop/Korea_S1-S3.pdf.

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[11] Shin, D.-H. (2009) 'Ubiquitous city: Urban technologies, urban infrastructure and urban informatics', Journal of Information Science 35(5), pp. 515-526.

[12] Ministry of Information and Communication (MIC) (2006) 'u Korea Master Plan', http://oti.newamerica.net/telecommunication_overview_south_korea/.

Central to the national IT plans are the development of an electronic infrastructure for ubiquitous services and the realisation of u-Cities[13]. The Korean e-government strategy started out with developing the IT capability of its government, followed by developing e-government services for citizens, and currently focusing on creating a ubiquitous society (including targeting convergence with other industries). The creation of a ubiquitous society is aimed for in two implementation steps: an establishment phase (2006-2010, the u-Korea plan) and a consolidation phase (2011-2014, the Smart Korea plan)[14].

The u-Korea plan was set up and aims to create the 'world's best u-society', based on an anytime/anyplace connection15. The u-Korea plan focuses on creating a 'top level' u-infrastructure with high internet bandwidth also aimed at offering services for mobile devices[16]. This includes bringing 50-100 Mbps to 95% of the 20 million Korean households[17]. In 2010, the government set up its Smart Korea IT Plan, which is to last until 2014/2015[18]. This phase is aimed at convergence and enhancing the infrastructure that has been laid out[19]. Whereas the u-Korea plan focuses mainly on infrastructure development, realising high quality internet connection for everyone, the Smart Korea program focuses on connecting the infrastructure with different types of devices, software, platforms and network technologies, developing ubiquitous services. Currently, the government is also implementing its Giga Korea plan (2013-2020) aiming to upgrade bandwidth yet again to 10 Gbps for the fixed network and 1Gbps for the mobile network[20].

Korea's IT Plans focus predominantly on developing a very sophisticated electronic infrastructure and on developing e-government services to enhance the capacity of government[21]. The u-Society establishes a strong link between the physical infrastructure, including elements such as broadband internet and RFID technology, and the electronic services that are delivered using this infrastructure, such as electronic income tax declaration. As South Korea pushes hard to achieve ubiquitous services in all areas, this has earned the county the first ranking in the UN e-government benchmarks of 2010 and 2012[22]. The notion of ubiquity presents the possibility to access these services through different devices, platforms and networks. In the Korean context, it appears that this notion of ubiquity is mainly implemented on the local level, in the many u-City projects.

2.1.1. Technological aspects

Broadband convergence Network (BcN)

The BcN project is generally considered the central effort of the ubiquitous society. BcN was envisaged as a comprehensive internet protocol that enables citizens and organisations across the whole of Korea to connect from a wide range of platforms to a range of services.

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[13] Ministry of Public Administration and Security (MOPAS) & National Information Society Agency (NIA), 'Digital society development in South Korea', http://unpan1.un.org/intradoc/groups/public/documents/un-dpadm/unpan042711.pdf.

[14] MIC, 2006.

[15] Jeong, K.-H., Moon, J.-W. & Sepulveda, E. (2011) 'Country Case Study: Korea', ADB/ITU Workshop for Rural ICT Project, 30 June, http://www.itu.int/ITU-D/asp/CMS/Events/2011/ITU-ADB/FinalWorkshop/Korea_S1-S3.pdf.

[16] Shin, 2009.

[17] MIC, 2006.

[18] Park, M.-C. (2013) 'Digital Policy of Korea: Issues and Challenges', Presentation at EuroCPR, http://www.eurocpr.org/data/2013/Park_Korea.pdf.

[19] Park, 2013.

[20] Park, 2013.

[21] MOPAS & NIA.

[22] UNPAN (2012) 'United Nations E-Government Survey 2012: E-government for the people' New York: UN.

The general expectation was that television, telecom and Internet networks would completely converge into one single network with transmission speeds of 50–100Mb/s[23]. People imagined that ubiquitous networking would also be available through the BcN, whereby all electronic devices, such as refrigerators or digital televisions, could be used as network consoles to enable Internet access for customers anytime and anywhere. Unfortunately, none of these plans and expectations has been realised as of 2011[24].

BcN was carefully designed and implemented top-down by government agencies[25]. The Korean government invested heavily (around 70 billion dollars, or over EUR 50 billion) in the network[26]. At the start of the project, its contribution to economic productivity was estimated by the government at 95 trillion won (around EUR 65 billion) and 370,000 jobs by 2011[27]. The government expected that the monetary value of exports of BcN-related products would increase from the current 2.7 billion dollars (around EUR 2 billion) to 13.5 billion dollars (over EUR 10 billion) by 2010[28]. Studies by Shin (2007, 2009, 2010) show that the BcN network did not involve citizens in the design[29]. As a consequence, the network mainly meets the demands and needs of government and a few industrial partners that were involved in the development, which represented the large Korean conglomerates (chaebol).

The deployment of broadband has contributed to economic growth in other sectors, such as ICT equipment vendors that have generated a lot of growth[30]. Furthermore, the volume and growth of the domestic market have spurred the development of competitive technological solutions for network operators that Korean vendors are currently trying to export. ADSL-related export revenue, for example, rose from 0.3 million dollars (over EUR 0.2 million) in 1999 to 240 million dollars (around EUR 180 million) in 2001. It appears that corporations such as KT and Samsung are the main beneficiaries of the investment in broadband[31]. Around 11 trillion won (around EUR 7.5 billion) was spent on broadband internet between 2000 and 2003, resulting in 17 trillion won (EUR 11.5 billion) worth of industrial output and 5.8 trillion won (EUR 4 billion) of profit as well as around 600.000 jobs in Korea[32]. Another area that benefited from infrastructure development is Korea's gaming industry with a turnover of around 8.3 billion dollar (EUR 6.3 billion) in 2007[33]. Content-development such as gaming has developed more strongly in Korea than in other parts of Asia[34].

Besides investing heavily in broadband technology, since 2004 projects have been carried out regarding RFID technology and sensor technology.[35] RFID technology, video cameras and sensor technology are seen as an essential part of the u-City infrastructure, which are

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[23] Park, 2013.

[24] Shin, D. & Kweon, S. (2011) 'Evaluation of Korean information infrastructure policy 2000 – 2010: focusing on broadband ecosystem change', Government Information Quarterly 28(3), pp. 374–387.

[25] Shin, D.-H. & Jung, J. (2012) 'Socio-technical analysis of Korea's broadband convergence network: Big plans, big projects, big prospects?' Telecommunications Policy 36, pp. 579-593.

[26] Shin & Jung, 2012.

[27] Park, 2013.

[28] Park, 2013.

[29] Shin, 2009; Shin, D.-H. (2010) 'Ubiquitous City: Policy Concerns Related to the U-City in South Korea', Presented at the Pacific Telecom Council, 17 January, http://www.ptc.org/ptc10/program/images/papers/slides/Slides_Dong%20Hee%20Shin_RT5.pdf; Shin & Jung, 2012.

[30] Shing & Jung, 2012.

[31] Shin & Jung, 2012.

[32] Shin & Jung, 2012.

[33] Ovum consulting (2009) 'Broadband Policy Development in the Republic of Korea: A Report for the Global Information and Communications Technologies Department of the Worldbank, October, http://www.infodev.org/infodev-files/resource/InfodevDocuments_934.pdf.

[34] Ovum consulting, 2009.

[35] MOPAS & NIA.

all connected to the Broadband convergence Network (BcN) and Ubiquitous Sensor Network (USN)[36].

2.1.2.   Services

The first Korean IT plans focused on strengthening the IT capability of government organisations and on the creation of an e-government infrastructure. An example of the former is the integration of resources within government in order to save costs of system construction by 52% and the development of a government-wide enterprise architecture[37]. Examples of the latter include the creation of electronic services, such as customised services portals for citizens (Korea e-Government Portal, www.korea.go.kr) and integrated services for businesses (Government for Business Portal, www.g4b.go.kr)[38]. Furthermore, the e-people portal aims to provide citizens with a single point of contact for proposals and complaints. The number of proposals increased from 570 in 2002 to 38.462 in 2006, while complaints are handled much faster: a decrease from 44 days in 2004 to 15.2 days in 2006.

EDUNET

An application in the field of education is EDUNET, which is education software introduced in 1996. In September 2008, EDUNET had around 5.8 million users[39]. The main driving organisations of these developments are the Ministry of Public Administration and Security (MOPAS) and the National Information Society Agency (NIA), a government agency implementing the policies of MOPAS in the field of the information society.

KONEPS

A notable example of a ubiquitous service is KONEPS, the Korea Online E-procurement System, which functions as a single window for all public organisations (central and local). 92% of all procurement is done electronically with a total transaction volume of 34 billion dollars in 2007.

E-Customs/U-Port system

In 2004 Korea introduced a single window system for all customs declarations in Korea's ports, with the aim to reduce 30 to 40% of time spent on this[40]. It use technologies such as RFID, USN and GPS to support these systems. The U-Port system encompasses an EDI-base port management and terminal management system, a web based single window system, and an RFID based automated port system. It allows tracking of goods for import or export and greatly decreases the time spent on customs declarations. The u-port systems saved more than 400 million dollars per year and contributed to large efficiency gains. Time spent on export customs clearance decreased from more than a day to less than two minutes, while the time spent on import customs clearance dropped from more than two days to less than two hours[41].

E-Health

In 2003 the Korea e-Health Association was established, focusing on four pillars: standardisation, law and policy planning, human resources management, and international

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[36] Kim, S.M., Kim, J.O., Yun, C.H., Park, J.W., Lee, Y.W. & Jung, H.S. (2011) 'Security Management of a Cloud-Based U-City Management System', The Second International Conference on Cloud Computing, GRIDs and Virtualization.

[37] MOPAS & NIA.

[38] MOPAS & NIA.

[39] Ovum consulting, 2009

[40] Ahn, K. (2011) 'Korean u-Port Project', KL Net, //www.unescap.org/tid/projects/tfforum11_klnet.pdf.

[41] MOPAS & NIA

collaboration[42]. Since 2008, following reorganisations between Ministries, the e-Health initiatives have been given an new impulse. While e-Health initiatives strongly focus on the exchange of patient recors, u-Health initiatives focus on the shift from healthcare at a hospital or doctor to the home or workplace using sensor technology.

u-Cities

The most prominent level of development of Korean u-Society are the u-Cities, for which more than 100 projects have been undertaken (more than twenty of them in a completely bottom-up manner) in larger cities such as Seoul, Songdo, Busan and Gwanju since 2007[43]. The u-City initiative "is a national urban development project that focuses on strengthening the role of information and communication technologies in civic planning and management"[44]. A u-City is a "city fully equipped with networks through which authorities can monitor almost everything that is happening in the city and take necessary measures on the spot, and residents can have access to necessary information and services for their daily lives"[45]. U-Cities thus aim to strengthen the role of government and create a more secure way of life, as well as to provide services to residents, thereby creating greater convenience. Especially the large scale on which the concept is applied stands out[46].

The main avenue for achieving these goals is the development of a state-of-the-art IT infrastructure and electronic services, such as (mobile and fixed) broadband networks, RFID technology, sensor networks, smart living platforms, location-based services and smart-card systems[47]. The scope and scale of these projects is determined by the specific needs of the region. For example, Busan's u-City project has focused on providing services in areas such as u-Tourism, u-Safety and u-Health, whereas the Incheon Free Economic Zone's (IFEZ) u-City project has also included larger scale initiatives such as the establishment of the urban integrated monitoring system for crime and disaster prevention, the construction of the u-City experience centre, and services such as u-Biz Support[48]. These examples will be described in more detail.

Busan Green u-City

The Green u-City of Busan[49] is built on top of a cloud-based technical platform on which both free governmental services as well as paid services are provided. It is set up as a public private partnership between Busan Metropolitan City, Cisco and KT, who jointly invest around 452 million dollars in the project. KT as a mobile operator operates the cloud architecture, providing access to services also from mobile devices, which is considered central to the project. The blueprint consists of five areas of smart developments: community (comprising work, healthcare and learning), mobility, energy and resource recycling, safety and security, and logistics. The revenues from the first year exceeded 2.2 million dollars for the commercial services and 42.000 dollars for the city of Busan. The main goals for the city are to develop cost-effective utility services such as waste management, logistics and the use of resources, to create new jobs, and to achieve environmental goals to become a greener city, for example, by reducing carbon dioxide

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[42] Lee, M., Min, S.D., Shin, H.S., Lee, B.W. & Kim, J.K (2009) 'The e-health landscape: current status and future prospects in Korea, Telemed Journal of E-Health 15(4), pp. 362-369.

[43] Kim et al., 2011.

[44] Shin, 2009, p. 515.

[45] Shin, 2010.

[46] Shin, 2009.

[47] Shin, 2009.

[48] GSMA (2012c) 'South Korea: Busan Green u-City', August, http://www.gsma.com/connectedliving/wp-content/uploads/2012/08/cl_busan_08_121.pdf.

[49] GSMA, 2012c.

emissions. Finally, using sensor technology (WLAN, NFC and RFID), smart buildings are created being equipped with services such as energy management.

Songdo u-City

Songdo u-City is neighbourhood of Incheon (which is part of the Seoul conglomerate) that is built from scratch, installing wiring and sensors in every new building and in the infrastructure. It houses, besides apartment blocks that have conference rooms and smart meters installed, a university equipped with the latest ubiquitous technology also based on a Cisco platform. It has a well-developed traffic management system spanning a large sensor network including CCTV cameras and a traffic light system that uses the sensors on vehicle detectors[50]. For example, around schools, drivers are warned to curb their speed using facial emoticons. Using u-mobile services allows citizens to receive weather and traffic information. Another manifestation of ubiquity is the u-disaster service, which is a thermal imaging camera that has been placed on top of a high building to gather weather information across Songdo, but it also captures conditions such as large fires or pollution and is able to warn the emergency services if necessary based on abnormal measurements. It is estimated that Songdo required an investment of 35 billion dollars.

The government agency driving these u-City developments has mainly been the Ministry of Information and Communication (MIC) that has been a key player for e-government services since 2003, investing around 60 million dollar in the initial stages of the u-City initiative and investing 297 million dollars in an RFID research center[51]. The roll-out of the u-City initiative within MIC is carried out by the Broadband convergence network division[52].

However, Shin (2009, 2010) finds that little progress seems to have been made with the u-City projects since 2008. Except for a few u-Cities that had already been completed by then, most projects stalled as a result of a lack of budget or other obstacles[53]. The underlying reason was felt to be the dominance of MIC over other stakeholders.The MIC implemented these projects in a top-down manner, without involving other groups sufficiently in the development of the projects. Furthermore, certain technologies were implemented without creating the relevant legislation first, such as RFID technology, causing opposition[54].

2.2. Japan

2.2.1. Policy objectives

In Japan, revenues and expenditures for electronic services are shared between the central and local government (local governments thus play a large role in the delivery of public services). There is significant reliance upon private sector involvement in the delivery of government services so formally, the civil service mostly works at the local government level. Japan assigns little flexibility in how executive agencies and Ministries can make changes to budgeted funds each year (thus placing more emphasis on strict forward planning). There is a degree of delegation provided to departments within the central

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[50] Advanced Technology Korea (2012) 'Meet a Ubiquitous City! Songdo, South Korea' January 11, http://www.advancedtechnologykorea.com/9801.
[51] Shin, 2009.
[52] MIC, 2006.
[53] Shin, 2009; 2010.
[54] Shin, 2009.

administration[55]. An overview of Japanese e-government policy frameworks is provided in Table 4.

Table 4:   Japanese e-government policy frameworks

Year	Name	Policy objectives
2000-2005	e-Japan	Framework programme aimed at promoting digitalisation and IT utilisation in key sectors
2006-2010	u-Japan	Construction of a ubiquitous network society through IT, in particular ensuring access to ultrahigh speed network access for the whole population, with the goal of seamless access via fixed and/or wireless broadband
2009-2010	i-Japan	Strategy to use the potential of ICTs to further social integration and lead to a better quality of life by connecting local communities and citizens with public administration, while enhancing the competitiveness of Japanese industry
2010-2015	New Strategy in Information and Communications Technology	Extension of the i-Japan strategy, with a focus on forging a new knowledge society driven by citizens

During 1999, articles on ubiquitous computing started appearing, but in contrast to this, a new concept was created in Japan by the thinktank Nomura Research Institute. The concept was the ubiquitous network, which focuses on complete accessibility to networks and the internet everywhere, for everyone, and at any time. It differs from Weiser's notion of ubiquitous computing by focusing on strengthening the global competitiveness of the Japanese IT industry[56]. The whitepaper on Information and Communications in Japan from 2004 stated: "A ubiquitous networked society is becoming a reality in which anyone with any device at any time from any place can access a network and freely exchange information". The Japanese Ministry of Internal Affairs and Communications (MIC) started a study on ubiquitous networking around 2000 and in 2002 issued a report on 'Ubiquitous Networking'. It argued that the context aware computing environments embedded in our real world interconnected by broadband fixed/mobile networks will greatly enhance services to end users and bring convenience and security to all people[57].

Whereas 'e-Japan' (the framework programme for the period 2000-2005) mainly aimed at promoting digitalisation and utilisation in key sectors, 'u-Japan' (defined for the period 2006-2010) focused on constructing a ubiquitous network society through information technologies, in particular ensuring seamless access to ultrahigh speed networks via fixed and/or wireless broadband for the whole population. Migration to digital networks (of, for instance, TV services, with the consequent freeing up of large segments of

[55]   RAND Corporation (2010) 'Cloud Computing in the public sector: rapid international stocktaking', Study for The Netherlands' Ministry of Internal Affairs and Kingdom Relations, Santa Monica.

[56]   Murakami, T. (2005) 'Japan's national IT Strategy and the Ubiquitous Network', NRI Papers, Nomura Research Institute, 97.

[57]   Ohashi, M. (2010) 'Japanese Ubiquitous Network Project: Ubila', in: H. Nakashima et al. (eds.), Handbook of Ambient Intelligence and Smart Environments, Springer Science+Business Media.

radio spectrum for innovative uses) and extension of coverage were planned to be driven mainly by the private sector.

In 2006, the government began to subsidise capital expenditure by private companies for the development of broadband infrastructure, and to provide tax benefits and low-interest financing for such projects. Although the u-Japan strategy has been quite successful in facilitating the extension of broadband access to Japan's population centres, private companies have been hesitant to build the infrastructure required to provide broadband service to Japan's isolated islands and mountainous areas. These areas therefore received direct government aid for satellite access[58].

Furthermore, the u-Japan initiative aimed at the resolution of social and economic issues by ICT. These technologies were seen as the key element of coping with the challenges of the 21st century, such as health care issues due to a rapidly aging society, environment and energy, public safety, etc. It had an overarching view of the societal goals achievable by digitalisation, incorporating social programmes for the disabled, elderly and young (e.g. in the u-Japan charter for Ubiquitous Network Society)[59]. Therefore, measures of success include 80% of the population to feel comfortable using ICTs and appreciate the benefits of ICTs in resolving social problems through social reform and human development[60].

The u-Japan strategy was followed up by the 'i-Japan' strategy in 2009 for the years 2010-2015, which announced its goal as 'non-linear change' in approach towards a user-centred digital society. There is an emphasis on choices, intuitive use of technology and distribution of information and knowledge. The programme has a holistic view of the potential of ICTs to further social integration and lead to a better quality of life by connecting local communities and citizens with public administration, while enhancing the competitiveness of Japanese industry. The i-Japan strategy was replaced in 2010 by the 'New Strategy in Information and Communications Technology', which takes over the general structure of i-Japan, but on time horizon extending to 2020, with the goal of forging a new knowledge society driven by citizens[61].

2.2.2. Technological aspects

Broadband/ FTTP

By mid-2012, Japan had over 35 million broadband lines in place[62]. Broadband has grown at very high speed since the early 2000s. In 2012, 28% of the Japanese population had a broadband subscription[63]. These infrastructure deployments and the move to Next Generation Network architecture have driven VoIP subscriptions to over 25 million with Softbank and NTT taking the market lead. Japan has also been an early adopter of triple-play models which provide television, broadband internet and voice telephony as packaged services from a single provider[64]. Although there is a plethora of small providers, most of

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[58] Kobayashi, H., Fleming, R., Kawakami, S. & Toda, C. (2010) 'Japan', in: H. Nakashima et al. (eds.), Handbook of Ambient Intelligence and Smart Environments, Springer Science+Business Media.

[59] Cabinet of the Prime Minister of Japan (2010) 'A New Strategy in Information and Communications Technology (IT)', May, http://www.kantei.go.jp/foreign/policy/it/100511_full.pdf; Ohyama, N. (2011) 'Japan's New ICT strategy in e-Government and Social Security Services', http://asiaiccardforum.net/news/04-01-2011-01/data/AICF_2010_Ohyama.pdf.

[60] Murakami, 2005.

[61] Cabinet of the Prime Minister of Japan, 2010; Ohyama, 2011.

[62] OECD Broadband portal statistics (2012a), http://www.oecd.org/internet/broadband/oecdbroadbandportal.html.

[63] OECD, 2012a.

[64] Research and Markets (2013) 'Japan Broadband Market: Overview and statistics', www.researchandmarkets.com%2Freports%2F328637%2Fjapan_broadband_market_overview_statistics.pdf&ei =udCHUYviIqSsyAGjt4CQBQ&usg=AFQjCNFIfwPoqOrUbFxtzM9wrc1n9BeiRQ&sig2=atvAhdwG7ql9K9VRGInXoA.

the broadband market is dominated by a few large companies, with the incumbent national carrier NTT (now privatised and split into NTT East and NTT West) being a dominant player in the network layer.

While unbundling had been effective for the copper wire sector, attempts at creating more competition by unbundling in the fibre market have not had the desired effect. From 2005 to 2009, the Japanese government continued to enforce unbundling regulations on new fiber-optic lines. In the process, cable television and electric companies, competitors of the regulated firms, reduced or stopped building fiber-optic lines. As a result, regulated firms have dominated the infrastructure market with the increase of unbundling usage, and regulators failed to encourage competition in the building of fiber-optic networks. Ultimately, NTT's share expanded with the increase of unbundling[65]. The main enterprises in the broadband market are NTT (East and West); cable television Networks; Softbank (which has the largest share of the declining ADSL market); e-Access and KDDI. Approximately two-thirds of the FTTP market is dominated by the two branches of NTT[66]. Japan and South Korea are the only countries having a larger than 50% share of FTTP in the broadband market[67]. While broadband coverage is around 28% of the population, large segments of the population access the internet through mobile devices. Furthermore, several public administrations (e.g. education, health) are still mainly paper-based, reducing the necessity for having internet access to connect with these services[68].

e-Learning

Japanese e-learning policy was reformed in 2011 with the abolition of the National Institute of Multimedia Education (NIME) funded in 1978 and the transferring of their activities, including provisioning of distance learning courses and management of national database for educational resources, to the Open University of Japan upon failure of the e-Learning content sharing database NIME-glad[69]. The Open University is also a member of the Japan Open Courseware Consortium UPO-net, providing open educational materials[70]. However, courses by the Open University are still characterised by one-way broadcasting of content rather than interactive use, as state-sponsored distance learning initiatives and iInternet-based learning material are required by law to be accompanied by equivalent TV-based courses. At the same time, public-private partnerships in virtual content delivery in higher education are rather e-Learning awards were awarded to a project between universities and Hitachi on delivering university lectures on cancer treatment to medical professionals[71]. Some initiatives in private higher education are geared towards the rollout of fully accredited virtual universities, funded by private companies, such as the Cyber University[72].

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[65] Minamihashi, N. (2012) 'Natural Monopoly and Distorted Competition: Evidence from Unbundling Fiber-Optic Networks', Bank of Canada.

[66] Sugaya, M. (2012) 'Regulation and Competition in the JP Broadband Market', http://www.ptc.org/ptc12/images/papers/upload/PTC12_Broadband%20Policy%20Wkshop_Minoru%20Sugaya.pdf.

[67] OECD, 2012.

[68] Sugaya, 2012.

[69] Kato, H. 'Vicissitudes of NIME (National Institute of Multimedia Education)', World Bank, http://siteresources.worldbank.org/Education/Resources/278200_1289345265576/1101_006_Kato_ppt_Japan.pdf.

[70] Japan Open Courseware Consortium, http://upo-net.ouj.ac.jp/.

[71] Sonicfoundry (2011) 'Japan Ministry Of Education Recognizes Tsukuba University And Hitachi Ke Systems Ltd. With E-Learning Award For Cancer Education Program Powered By Mediasite', Tokyo, 7 December, http://www.sonicfoundry.com/press-release/japan-ministry-education-recognizes-tsukuba-university-and-hitachi-ke-systems-ltd-e.

[72] GSMA (2012b) 'Softbank University Case Study', http://www.gsma.com/connectedliving/wp-content/uploads/2012/04/gsmasoftbankcyberuniversitycasestudy.pdf.

Although access and infrastructure-focused policies resulted in virtually universal coverage of schools and several pilot projects looking at the use of technology in classrooms, the use of eLearning in formal education (e.g. number of computers in classrooms and teachers' ability to incorporate eLearning in curricula) in Japan has been found to lag behind that in other developed countries such as the US or Korea[73]. This reflects a more traditional and teacher-centered approach to education than in Western countries, despite the fact that technology use outside the classroom is rather elevated[74]. The 2012 New Strategy in ICT (Education), jointly directed by the Ministry of Communications and the Ministry of Education and Technology, has laid down a roadmap to address this lag. "Through the use of ICT, i).

By facilitation of 'collaborative learning', develop bidirectional learning environment in the classrooms, ii) Reduce teacher's burden in classrooms and iii) Create an environment of the 21st Century in which pupils will more easily upgrade their ICT-utilisation capability, thereby reducing the public disparity in information utilisation and promote ICT-based lifetime learning opportunities in the society"[75]. However, the accessible planning documents still have a strong emphasis on infrastructure and access (e.g. providing students with tablet computers) in addition to the societal function of fostering collaborative learning environments and improving teachers' IT skills[76].

Overall, e-learning and m-learning in Japan appear to be driven by the private sector, especially as governmental programmes have focused principally on access and infrastructure rather than implementing user-centered approaches. E-Learning outside formal education is more developed and more promising, despite the absence of dedicated policy or funding programmes at the government level. M-learning in 2010 was a 1.36 billion dollars (1 billion EUR) market.[77] Besides packaged software, the fastest growing segment of this market are apps, in particular for language learning (the most popular paid software downloaded from iTunes is one for memorising English words). The above-mentioned Cyber university also offers college courses via m-learning.

e-Health

Japan's e-health initiatives are perhaps best know through futuristic developments such as telemedicine, robotics[78] and wearable sensors[79] to achieve, for example, better care at home for the elderly. However, e-Health systems such as integrated patient record systems, however, are not implemented yet and the development of these solutions still faces severe

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[73] Kusano et al. (2013) 'The Effects of ICT Environment on Teachers – Attitudes and Technology Integration in Japan and the U.S.', Journal of Information Technology Education 12, pp. 29-43, http://jite.org/documents/Vol12/JITEv12IIPp029-043Kusano1210.pdf; Ministry of Education, Culture, Sports, Science, and Technology (MEXT) (2011) 'Survey on the actual situations of computerization of school education', http://www.itu.int/ITU-D/finance/work-cost-tariffs/events/tariff-seminars/Japan-13/documents/Sess5-2_FutureSchool_Kobayashi.pdf.

[74] Aoki, K. (2010) 'The Use of ICT and e-Learning in Higher Education in Japan', World Academy of Science, Engineering and Technology 42, pp. 854-858, http://www.waset.org/journals/waset/v42/v42-141.pdf; OECD (2012c) 'Turning on Mobile Learning in Asia: Illustrative Initiatives and Policy Implications', http://unesdoc.unesco.org/images/0021/002162/216283E.pdf.

[75] ITU (2013) 'Future School Promotion Project', http://www.itu.int/ITU-D/finance/work-cost-tariffs/events/tariff-seminars/Japan-13/documents/Sess5-2_FutureSchool_Kobayashi.pdf.

[76] ITU, 2013.

[77] Toto, S. (2012) 'Mobile Learning in Japan: Status quo and trends', http://www.slideshare.net/serkantoto/apac-mobilelearningserkantotofinal.

[78] Swedish Agency For Growth Policy Analysis (2010) 'eHealth and Patient-Centered Care Processes in Japan: Pre-Study', June, http://www.vinnova.se/upload/EPiStorePDF/eHealthPatientCenteredCareProcessJapan.pdf.

[79] Kurematsu, H. (2011) 'e-Health in Japan: Introduction of Telemedical Care System - Body Area Network (BAN) at NICT', http://www.itu.int/ITU-D/cyb/events/2011/Telecom11/e-health/Presentations/thursday4-%20e-health%20in%20Japan-NICT.pdf.

challenges, such as the lack of interoperability of systems, insufficient privacy protection, and the lack of universal registry of hospital data[80].

e-Tax

Japan's e-Tax initiative was developed by the National Tax Agency (NTA) in order to decrease the workload of the organisation in times of austerity. The system is web-based and comprises an income tax returns filing and payment services, both for citizens and businesses. The costs of the software development were 50 billion yen (around EUR 380 million)[81]. The system aims to radically lower transactions, both for the NTA and for the taxpayers. Via the e-Tax service, taxpayers have access to several services: registering the use of the e-Tax service, preparing online tax returns, both for citizens and businesses, getting information on the value of properties via a geographical information system, and payment services for paying taxes through links to banking services of the taxpayers.

Smart cities

Sustainability, energy efficiency and system resilience achievable by smart grids have gained prominence on the policy agenda since the 2011 earthquakes. While green IT and Intelligent Transport Systems are among the priority areas identified by i-Japan, current Smart city initiatives (such as the four pilots in the government's Smart cities programme comprising Toyota city, Yokohama, Keihanna and Kitakyushu taking place between 2010-2014) appear to predominantly focus on increasing the quality of life of citizens through green ICTs and smart grids[82]. These initiatives are a result of cooperation between government and industry, involving large Japanese conglomerations (such as Sumitomo and Mitsubishi Electric for Yokohama). From the government side, the four pilots have received subsidies of 8.6 billion yen for 2013 and 10.6 billion yen for the 2012 fiscal year[83]. Other smart city projects have been driven by local government and large conglomerates, for instance the Panasonic-branded Fujisawa 'Smart town',[84] managed as a self-standing company. Similarly to the pilots, the focus of other smart city initiatives appears to be on green energies and sustainability, with only the Fujitsawa pilot aiming at all-round smart service provision[85]. Ultimately, positioning national champions as service providers in government-backed projects is an instrument of industrial policy aiming to strengthen the export capacity of Japanese companies[86].

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[80] Akiyama, M. & Nagai, R. (2012) 'Information Technology in Health Care: E-Health for Japanese Health Services', March*, csis.org/files/publication/120327_Akiyama_JapaneseHealthCare_web.pdf.*

[81] Chatfield, A.T. (2009) 'Public Service Reform through e-Government: a Case Study of 'e-Tax' in Japan', Electronic Journal of e-Government 7(2), pp. 135-146.

[82] Japan smart city program, http://jscp.nepc.or.jp/.

[83] Ministry of Economy, Trade and Industry (METI) 'FY 2013 Budget', http://www.meti.go.jp/english/aboutmeti/policy/fy2013/pdf/130129budget.pdf.

[84] Panasonic Smart City program, http://panasonic.net/es/fujisawasst/.

[85] Sapporo Smart City, https://smartercitieschallenge.org/executive_reports/SmarterCities-Sapporo.pdf; Fujitsu Smart City program, http://www.fujitsu.com/global/about/responsibility/feature/2012/smartcity/.

[86] GSMA (2012a) 'Smart Mobile Cities: Opportunities for Mobile Operators to Delivery Intelligent Cities', http://www.gsma.com/connectedliving/wp-content/uploads/2012/03/intelligentcitiesreport0411lores.pdf.

2.3. US

2.3.1. Policy objectives

Open government

After the 2008 election the term 'government 2.0' became important within the US government's overall strategy. President Obama founded the 'Open Government Initiative' that consists of three pillars: transparency, participation, and collaboration[87]. In some ways, the open government initiative was a follow-up to the 2002 E-Government Act[88], shifting focus from the delivery of electronic services to the provisioning of open data to increase transparency.

The Open Government Directive framework was used as a guideline not only for the federal government but also for state and local governments across the US The forthcoming initiatives include top-down projects as well as citizen-orientated initiatives focusing on crowdsourcing or projects accompanied by organisations shared with the public via social media. In the beginning, many efforts were focused on quick success such as launching social media channels or apps for existing sector-specific initiatives, but the key factor sustainability was soon put into focus. The objective is to foster start-ups so that apps can be further elaborated and to encourage projects to base apps or software on open source[89]. Other open government projects went from loose joint projects to dedicated budget. The open government efforts are less about technology but more about qualified human capital, competence, and responsibilities. For instance, some US cities have installed chief digital officers, data officers and innovation officers[90].

It is fair to state that the notion of 'ubiquity' functions only as an underlying vision of all kinds of e-services which are partly accessible from different devices; however, many of them are only accessible via fixed internet access. Social networks and other feedback options or interactive elements often play an important role. Nonetheless, the term 'ubiquitous' seems to be used as a concept rather than a definition for the overall government 2.0 efforts.

2.3.2. Technological aspects

In the summer of 2012, the General Services Administration (GSA) announced a single authentication standard for government cloud-computing services. The Federal Risk and Authorization Management Program, known as FedRAMP, will define the security requirements that cloud-computing providers will have to fulfill to receive government contracts.

A recent study[91] about the status of the use of cloud computing by state and local government shows a significant change during the last year. The number of applications in the cloud has increased significantly. 15% of US states have already highly invested in cloud computing and 56% have some applications in the Cloud and are considering others. Examples for cloud solutions are e-mail and collaboration (64% of all states using cloud

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[87] Open Government Initiative, http://www.whitehouse.gov/open/about.

[88] E-government Act, PUBLIC LAW 107–347—DEC. 17 2002.

[89] For example, the 'Code for America' non-profit organization is "building a network of cities, citizens, community groups, and startups, all equally committed to reimagining government for the 21st century". Currently, they are focusing on growing and improving a key set of open source apps. Code for America, http://codeforamerica.org/about/.

[90] Philadelphia and Boston now have a Mayor's Office of New Urban Mechanics. San Francisco established a program for young IT professionals working part-time in public administration to gain experience in this field, Mayor's Innovation Fellowship, http://innovatesf.com/mayors-innovation-fellowship/.

[91] National Association of State Chief Information Officers (NASCIO) (2012) 'The 2012 State CIO Survey', October, http://www.nascio.org/publications/documents/NASCIO-2012StateCIOSurvey.pdf.

computing), storage (48%), Geographic Information Systems (48%), Disaster recovery (44%), Program/business applications (e.g., licensing, unemployment insurance, workers' compensation, etc.) (42%), and office productivity software (e.g., word processing) (3/%)[92].

2.3.3. Services

USA.gov

A general ubiquitous strategy is pursued by the main US government website 'USA.gov'[93]. USA.gov's objective is to provide a free service for the public so that US government information can easily and rapidly be found. USA.gov offers a powerful search engine and an index of web-accessible government information and services 'anyhow and anywhere'. Interaction is possible by e-mail, chat, or phone. The several hundred services range from tracking the status of immigration cases to drivers licences and vehicle registration, and from options for health insurance to today's weather forecast. The website provides a list of all registered services on federal, state and local level; however, it does not evaluate or recommend services or websites for the public. Interested agencies or initiatives have to indicate their services to USA.gov to get included in the search engine.

USA.gov is the government's official web portal and provides US government information and services on the web. It is an interagency initiative administered by the Federal Citizen Information Center, a division of the US General Services Administration's Office of Citizen Services and Innovative Technologies. It was legislatively mandated through Section 204 of the E-Government Act of 2002. Everyone can access the information on the USA.gov website via standard internet access or mobile app. Social networks like Facebook, Twitter, as well as YouTube, a blog, RSS feeds, and StumbleUpon are integrated as well. The website provides an overview with links to all official US government transactions, services, and information from one location ('one-stop-shopping' policy). Any e-service provider - public authority or private organisation - may apply to link to the website if its offerings fit into the context.

The website´s emphasis is more on information and less on transaction, however it links to hundreds of specific thematic websites and offerings as well as databases, indexes, maps, and exchange or transaction services.

Open government

The US Chief Technology Officer and US Chief Information Officer created an Open Government Dashboard tovisualise the state of the open government initiative[94]. The dashboard tracks agency progress on the deliverables set out in the Open Government Directive and maps all relevant initiatives. Every federal department published an Open Government Plan with a roadmap for making operations and data more transparent, and expanding opportunities for citizen participation, collaboration and oversight.

The dashboard of all main OpenGov inititatives is shown in Table 5. In general, some of the flagship initiatives coordinate and summarise serveral dozens of inititatives on federal, state, and local level[95].

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[92] NASCIO, 2012.

[93] USA.gov, http://www.usa.gov/.

[94] Open Government Initiative: Around the Government, http://www.whitehouse.gov/open/around.

[95] Open Government Initiative: Fact Sheet: Open Government Flagship Initiatives, http://www.whitehouse.gov/open/documents/flagship-initiatives.

Table 5:   Open Government Flagship initiatives

Type of initiative	Name	Objective
Government Information	Data.gov	The purpose of Data.gov is to increase public access to high value, machine readable datasets generated by the Executive Branch of the Federal Government.
	Federal Register	The daily journal of the US government, an unofficial, HTML (XML-based) edition of the daily Federal Register ('Federal Register 2.0' or 'FR2'). The aim of the digital register is to foster public participation.
	RegInfo.gov	RegInfo.gov is a United States Government website produced by the Office of Management and Budget (OMB) and the General Services Administration (GSA). OMB's Office of Information and Regulatory Affairs (OIRA) reviews Federal regulations and information collections. OIRA also develops and oversees the implementation of government-wide policies on information technology, information quality, privacy, and statistics. The website enables the public to access all regulatory information.
Performance and Accountability	IT Dashboard	The IT Dashboard is a website enabling federal agencies, industry, the general public and other stakeholders to view details of federal information technology investments.
	Open Government Dashboard	The Dashboard tracks agency progress on the deliverables set out in the Open Government Directive, including each agency's Open Government Plan.
	Performance.gov (beta)	Performance.gov provides information about the Obama Administration's approach to improving performance and accountability. The website shows progress on the Administration's efforts to increase effectiveness, efficiency, innovation, and responsiveness.
	Recovery.gov	Website shows how Recovery funds are being spent by recipients of contracts, grants, and loans, and the distribution of Recovery entitlements and tax benefits.
	USAspending.gov	Collecting data about the various types of contracts, grants, loans, and other types of spending to provide a broader picture of the Federal spending processes.

Type of initiative	Name	Objective
	Regulations.gov	Website to submit comments on proposed regulations and related documents published by the US Federal government, also to search and review original regulatory documents.
	Challenge.gov	Challenge.gov is an online challenge platform administered by the US General Services Administration (GSA). Government agencies post challenges and the public can post submissions to these challenges.
	Partner4solutions	Website for the Partnership Fund for Program Integrity Innovation. Using funds appropriated by Congress, the Partnership Fund will fund pilot projects and evaluations that test ideas.
Citizen Services	Benefits.gov	Official benefits website of the US government to inform citizens of benefits they may be eligible for, provides information on how to apply for assistance.
	Business.gov	Meta-Website for small businesses and exporters to quickly connect businesses to the services and information relevant to them.
	DisasterAssistance.gov	Website to find disaster assistance (over 70 forms of assistance from 17 federal agencies), application help to apply for disaster assistance and tool to check progress of applications.
	GovLoans.gov	Gateway to government loan information
	Grants.gov	Tool to find and apply for federal grants (information on over 1,000 grant programs)
	Healthcare.gov	Federal government website managed by the U.S. Department of Health & Human Services about all aspects of the health care system (e.g. Health Insurance Marketplace to find health insurance)
	USA.gov	U.S. government's official web portal, provides government information and services on the web. The aim is to "provide trusted, timely, valuable government information and services when and where you want them."

Source: Open Government Initiative: Around the Government, http://www.whitehouse.gov/open/around.

Healthcare.gov

The e-health and insurance website 'Marketplace' is a means by which to find adequate health coverage via the internet. It is a set of government-regulated and standardised health care plans in the United States, from which individuals may purchase health insurance eligible for federal subsidies. Through the Marketplace, residents and small business owners will be able to compare quality and affordable health insurance options, apply tax credits directly, and receive enrolment support. The health coverage platform on the Marketplace will open on 1 October 2013 with plans effective on 1 January 2014.

Healthcare.gov[96] for citizens is accompanied by a partner-programme for small enterprises, the Small Business Health Options Program (SHOP) for businesses with fifly or fewer full-time equivalent employees. Citizens, employees and employers register for the platform and can search for offerings or place their insurance schemes. Standard internet access suffices. Hotlines help people with disabilities to gain information. Mobile access does not yet exist, but the service is integrated into the best-known social networks to foster ubiquity. States can participate in a partnership with the federal government, with the option of running the plan management and in-person consumer assistances functions. The other planned Marketplace functions will be operated by the federal government. All private health insurance plans offered via the website will have the same set of essential health benefits to guarantee a minimum standard and comparable qualitiy of insurance benefits.

BusinessUSA

BusinessUSA[97] is a centralised, one-stop platform for businesses to access services in the fields of growth, competetiveness and employment issues. A new beta version of the platform was started in spring 2013, a first database was launched in 2011. BusinessUSA implements a so-called 'no wrong door' approach for small businesses and exporters by using a central internet platform to quickly connect businesses to the services and information relevant to them, regardless of where the information is located or which agency's website, call center, or office they want to use for help. The federal agencies continue to add financial resources to BusinessUSA to encompass the full range of business programs and services. To ensure that it is oriented towards the needs of the customer, BusinessUSA is designed, tested, and built in cooperation with US businesses and their organisations.

The central focus of the website is on time savings when searching for information. The platform gives an overview of business aspects that can be searched, tracked, and registered in regional areas. A database covers relevant topics in an enterprises lifecycle such as starting a business, begin exporting, investing in the US, and taxes and credit applications. A click on a head topic starts a short questionnaire. Depending on the answers, information is provided automatically from the database including weblinks to useful websites. Interactive elements such as a hotline, e-mail feedback, a knowledge base which is constantly updated and refined by professionals, and chat options are included.

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[96]   Healthcare.gov gives detailed information on all features of this e-insurance and e-health initiative.

[97]   The website businessUSA gives detailed information on all features of this initiative, www.business.usa.gov.

e-Learning

Over the past years, a robust growth of e-learning can be observed in a wide range of institutions. A recent study claims that over 6.7 million students were taking at least one online course during the fall 2011 term, an increase of 570.000 students over the previous year. Many educational institutes now offer online courses; thirty-two percent of higher education students now take at least one course online[98].

2.4. Canada

2.4.1. Policy objectives

Canada's economic policy is summarised in the 'Canada's Economic Action Plan 2013'[99]. Main objectives are "jobs, growth and long-term prosperity" to be achieved by a) connecting Canadians with available jobs b) helping manufacturers and businesses succeed in the global economy (e.g. support a globally competitive manufacturing sector, increase and diversify exports, and develop natural resources), c) investments in public infrastructure, d) investing in world-class research and innovation, e) supporting families and communities. Remarkably, there seems to be no focus at all on 'digital economy', 'digital markets or services' or on the ICT-industry in this recent major government programme.

The Information Technology Association of Canada (ITAC) criticizes strongly the lack of a national digital economy strategy. In 2011, the Canadian government promised to publish a National Digital Economy Strategy (DES) Consultation Paper by "the end of 2012", but no such paper has been made available yet[100]. The government announced that the paper will include:

- Capacity to Innovate Using Digital Technologies;

- Building a World Class Infrastructure;

- Growing the Information and Communications Technology;

- Digital Media: Creating Canada's Digital Content Advantage; and

- Building Digital Skills for tomorrow[101].

The aim is to roll out broadband infrastructure, create a public policy environment that encourages financial investments in technological innovation, and facilitate the use of digital technology to improve productivity and public services. It remains to be seen how the actual programme National Digital Economy Strategy will be designed. Evidently, the lack of a digital strategy is not perceived as a major difficulty by government officials at the moment. Three concerns are all likely to be more important: too few domestic customers, too little skilled labor, and too little capital.

Political programmes or initiatives who facilitate e-services or u-services are limited to basic approaces in the field of identification and digital signature or e-health. Examples that deal explicitly with 'ubiquitous services' were not identified in Canada.

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[98] 2012 Survey of Online Learning conducted by the Babson Survey Research Group (2013) 'Changing Course: Ten Years of Tracking Online Education in the United States', Newburyport, MA.

[99] Ministry of Finance (2013) 'Jobs, Growth, and long-term prosperity. Economic Action Plan 2013', March, http://www.budget.gc.ca/2013/doc/plan/budget2013-eng.pdf.

[100] See for example Nowak, P. (2013) 'A new year's resolution for a failed digital strategy', 7 January, http://www2.macleans.ca/2013/01/07/a-new-years-resolution-for-a-failed-digital-strategy/: "With the start of a new year, there's no better time to review and reflect on the federal government's complete and utter failure in providing leadership on digital issues. The country has been waiting on a digital strategy–a comprehensive plan for how Canada intends to compete in the global information economy–for years."

[101] Information Technology Association of Canada (ITAC) (2011) 'Update on Digital Economy Strategy', http://itac.ca/weblog/entry/itac_update_on_digital_economy_strategy.

2.4.2.   Technological aspects

iCanada

The iCanada initiative is working on a crowdsourcing project to fund broadband development in Canada[102]. The initiators – scientific community, ICT enterprises, IT information publishers and consultants as well as the Canadian Advanced Technology Alliance (CATA) and local government officials – founded a "not-for-profit movement of concerned Premiers, Mayors, and business, technology and research leaders"[103]. The motivation for iCanada is the perceived lack of innovation and application of IT. An important aim of iCanada is a movement dedicated towards making all Canadian communities into 'Intelligent Communities' with full e-services in the fields of e-health, e-work, e-commerce, e-education and e-government. iCanada is currently holding conferences and is fostering networking activities between some fifty Canadian communities.

2.4.3.   Services

Federating Identity Management

Federating Identity Management in the Government of Canada is described as the major stepping stone towards achieving a citizen-centered service model[104]. The program was launched in 2008. Its aim is to create a platform for a trusted identity between government and organisations. Federating Identity is a key element to the Canadian e-government strategy. The following milestones are already achieved:

- Launch of the Cyber Authentication Renewal initiative: definition of a government-wide framework to identify citizens and businesses that access government services over multiple delivery channels (in person, telephone, mail, and online);

- Completion of a Federated Pan-Canadian Identity Management and Authentication Framework to address legal issues, privacy, security, identity, assurance, trust, and the identity service experience;

- Revision of a Policy on Government Security. A new Directive on Identity Management was defined to realise a federated approach to identity management. Privacy and security requirements were addressed and services conceptualised that can be developed, administered, and delivered to a variety of clients.

Programs such as epass, Portageur, and the development of an assurance model were the first successful steps. Inter-jurisdictional work has produced the pan-Canadian identity management and authentication principles and initial framework, Canada Health Infoway's electronic health records program, British Columbia's BCeID, Alberta's Alberta Secure Access Service, Quebec's ClicSÉQUR, and more.

The vision is that of a federation of organisations that trust each others' assurances of identity and form a unique and standardised digital platform as a public key infrastructure to establish online services. A Digital identification and authentication Council (a public-private partnership) steers the programme[105]. The online identity card is not in use yet, but

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[102] iCanada 'Our Declaration. A New National Dream: global leadership through ultrafast communications', http://icanada.nu/about-i-canada-alliance/our-declaration/.

[103] A list of representatives of iCanada can be found at http://icanada.nu/about-i-canada-alliance/governance/cata-i-canada-council-of-governors/.

[104] Chief Information Officer Branch (2009) 'Federating Identity Management in the Government of Canada: A Backgrounder', http://www.tbs-sct.gc.ca/sim-gsi/docs/2011/fimgc-fgigc/fimgc-fgigc02-eng.asp#Toc232927504.

[105] Inter-jurisdictional Identity Management and Authentication Task Force (2007) 'A Pan-Canadian Strategy for Identity Management and Authentication, Final Report'.

will help to deliver secure services at low costs and good quality from government and the private sector to citizens as well as enterprises.

Canada Electronic Health Record System

The blueprint for Canada's Electronic Health Record System[106] was originally developed around 2009 as a vision for how electronic health record information could be securely and appropriately shared across Canada using information and communications technologies. The Blueprint has evolved since the initial version, providing better definition of how standards-based technology can be used to support data sharing. The purpose of The Blueprint is to provide the conceptual framework and working principles for the development of electronic health records that can share information across Canada. The building blocks include: individual electronic health records; health information management systems in large and small Point-of-Service applications; health information storage spaces and data warehouses; and special application services that display and look after the information when it is transferred from one place to another. By the end of 2010, an electronic health record was available for nearly half of all Canadians. However, many physicians are not using the platform[107].

ServiceOntario

Since 2000 Service Ontario offers a huge variety of online government services and seems to be a real best practice model because it is easy to use, and the services are clearly and thoroughly presented. Service Ontario[108] is currently a programme within the Ministry of Government and Consumer Services. It has the support of the Cabinet, the Minister, a Board comprised of Deputy Ministers from other ministries providing service, and key corporate stakeholders. Information and transactional services are delivered through four channels: online, in-person, kiosk, and telephone with a wide range of service guarantees (e.g., a two-day service guarantee for an electronic master business license).

ServiceOntario has built partnerships with the private sector to assist with service delivery (e.g., Teranet, a private sector company, provides access to the Ontario land registration system). The overall ambition of the government authorities is to offer a multichannel service delivery system, with particular emphasis on the electronic channel. The system evolved from a voluntary online basis for all ministries to the government's primary public-facing service delivery organisation[109]. Every year, almost 48 million transactions are conducted through ServiceOntario's online, phone and in-person channels. Driver's licences, vehicle registrations and basic Ontario health card services are available at almost 300 ServiceOntario centres across the province[110]. The ministry also provides human resources services and support via the system, manages and delivers modern, public IT solutions, and purchases goods and services on behalf of the people and businesses of Ontario.

2.5. Mapping and analysis of ubiquitous developments

After the four non-EU jurisdictions have been described, the ubiquitous services described in this section are mapped in Table 6. The mapping takes place according to the areas in which services were identified: (technological) infrastructure, e-procurement, e-learning, e-identity, e-health, e-customs, e-tax, citizens' and business portals, and smart city

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[106] Anyone can join the Infoway-Inforoute via http://knowledge.infoway-inforoute.ca/en/knowledge-centre/ehrsblueprintv2.aspx.

[107] Health Council of Canada, http://www.healthcouncilcanada.ca/rpt_det.php?id=165.

[108] ServiceOntario, http://www.ontario.ca/welcome-serviceontario.

[109] UN (2012) 'United Nations E-Government Survey 2012: E-Government for the People', pp. 79-81.

[110] The Ministry of Government Services presents figures on the usage of ServiceOntario on the website http://www.mgs.gov.on.ca/en/AbtMin/STEL01_045772.html.

developments. We did not find services in every category for every country, although agency specific services may exist in certain categories (such as e-procurement and e-learning services in the US, which are developed by individual agencies or organisations). This mapping has been undertaken by looking at major national developments, and is not an attempt to be exhaustive.

Table 6: **Mapping of services in non-EU jurisdictions**

Ubiquitous developments	South Korea	Japan	US	Canada
Infrastructure (focus)	BcN	FTTP	FedRAMP (secure Cloud Computing in e-government)	iCanada
e-Procurement	KONEPS	e-Bidding	Agency and local initiatives	Local initiatives
e-Learning	EDUNET	Open University	Local initiatives	Local initiatives
e-Identity	Residents Registration Number (RRN) was used until 2011, currently different forms such as iPIN are used simultaneously	Personal Identification Number	Integrating commercial developments such as Facebook ID	Federating ID Management
e-Health	u-Health using sensor technology for remote care	Initiatives in the area of robotics, telemedicine	Healthcare.gov	Electronic Health Record System
e-Customs	u-Port		Certified provider (MSR eCustoms)	Certified provider (MSR eCustoms)
e-Tax	NTS e-Tax filing	NTA e-Tax	e-Tax initiatives on state and federal level	Netfile initiative, plus free certified products available for taxpayers to file their income tax return online.

Ubiquitous developments	South Korea	Japan	US	Canada
Citizens' portal	e-People; Korea e-Government Portal	Open data portal to be opened soon	USA.gov; Open Government Initiative	ServiceOntario
Business portal	Government for Business Portal	Japan Business Portal	BusinessUSA	Export.ca; Canada Business Portal
Smart Cities	u-Cities (e.g. Busan, Songdo)	Smart Cities (e.g. Yokohama, Fujisawa)	Code for America	Local initiatives, such as Stratford, Toronto, Waterloo, and Windsor

Subsequently, the developments in the non-EU jurisdictions are compared according to a number of criteria: their definition of ubiquity, their approach to implementation of ubiquitous solutions, their policy focus and aim, the parties that are involved in the development, and those that sponsor the developments, the technological focus, the current situation, and the perceived impacts, drivers, and barriers (see Table 7).

Table 7:   Comparison of developments in non-EU jurisdictions

Ubiquitous developments	South Korea	Japan	US	Canada
Definition of ubiquity	u-Services are accessible via a sophisticated electronic infrastructure	u-Society is a society in which anyone with any device at any time from any place can access a network and freely exchange information	A general ubiquitious strategy is underlying the federal e-government initiative	No use of the term 'ubiquitous' in official documents or policy papers
Approach to implementation	Top-down, central, involving large industrial organisations	Overall political program/market frame	Coordination of federal, state, and local initiatives using portals and search engines	No overall ICT or 'e-society' national policy at the moment

Ubiquitous developments	South Korea	Japan	US	Canada
Policy focus	South Korea focuses on the many u-cities and u-ports and on u-services such as e-Tax, e-Customs	On the central level focus on high speed and convergence of network. On local level smart cities, sustainability, energy efficiency, system resilience and quality of life	Build up a high level of openness in government to reduce lobbying, control public spending and empower the public through ICTs	Focus on the local (state) level, attempts to scale to the national level, such as for the Federated Identity project
Policy aim	Create a world-class electronic infrastructure that allows citizens to connect anywhere anytime with online services in order to stimulate economic growth	u-Japan initiatives aim at the resolution of social and economic issues by ICT	Create a framework used on federal, state and local level to foster transparency, participation, and collaboration	Main objectives are jobs, growth and long-term prosperity
Parties involved	Public private partnerships with strong role for industrial players	Local government plays a large role and significant reliance upon private sector involvement	Federal, state, and local government, private involvement favored	State level plays a large role
Investments	Large government investments, and investments of private parties in public private partnerships	Government subsidises expenditure by private companies and provides tax benefits and low-interest financing for the development of broadband infrastructure	Main investor is the federal government, but other government agencies or private initiatives can join the many initiatives by being present under the federal programmes´ websites or solutions	Scientific community, ICT enterprises, IT information publishers and consultants as well as the Canadian Advanced Technology Alliance (CATA)

Ubiquitous developments	South Korea	Japan	US	Canada
Technological focus	Cloud based infrastructure development with very fast broadband, integration of sensor technologies	Ensuring access to ultrahigh speed network access for the whole population with the goal of seamless access via fixed and/or wireless broadband	Focus on open standards, promotion of mobile apps, cloud computing for e-government applications	The iCanada initiative is working on a crowdsourcing project to fund the broadband development in Canada
Current state	Many ubiquitous services, u-Cities have been built or developed. In certain areas	Japan is the second largest OECD broadband country after US. The percentage of broadband subscriptions is 28%, but manyJapanese access the Internet through mobile devices; several administrations still use paper-based services	Achievements since 2009 can be monitored via the Open Government Dashboard. E-Health initiative faces some difficulties as enterprises need more time to fulfill legal requirements for health insurance. Business.usa.gov recently launched successfully first beta version	*No national e-government policy framework; 'ServiceOntario' offers online public services; initiative on the basis of crowd funding trying to establish smart cities" but projects are at early stages*
Perceived impacts	Broadband has contributed to economic growth. Development of the domestic broadband market spurred export (ADSL related export revenue rose from 0.3 in 1999 to 240 million dollar in 2001).	Quite successful in facilitating broadband access to Japan's population centres; some e-government services have been developed, such as for e-Health, e-Customs and e-Tax	Focus on and attention for transparency by building a website structure that puts the several hundred initiatives, programmes, and solutions in a hierarchical order	Federated Identity project has made e-ID solutions interoperable across different provinces.

Ubiquitous developments	South Korea	Japan	US	Canada
Perceived drivers and barriers	uCity projects were successfully implementated with large government and private sector funding. Privacy concerns have been raised after widespread use of RFID without first creating legislation.	Private companies have been hesitant to build the infrastructure required to provide broadband services to Japan's isolated islands and mountainous areas.	There are federal initiatives to coordinate open government initiatives online. Awareness of transparency and participation has increased as a result of the open government initiative.	Little sense of urgency for e-government; other societal challenges are considered more important – hence the lack of IT strategy in place.

3. UBIQUITOUS SOLUTIONS IN EU MEMBER STATES

KEY FINDINGS

- The e-Estonia strategy is based upon the assumption that successful introduction of e-services is built on a decentralised, distributed system in order for all components to be linked or added on a platform-independent basis. Centralised databases or systems are avoided. Small, efficient projects are favoured over large-scale developments. Four goals of the 'ubiquitous' strategy are to be particularly stressed: 1) provide inexpensive internet access to citizens, 2) digitalise data necessary for government services, 3) formalise and standardise the exchange of these data, and 4) introduce a digital identity.

- Ubiquitous solutions in Estonia cover a wide range of services. Large-scale solutions include the common public infrastructure X-road, the Electronic ID Card and Digital Signature identification and authentication services, electronic registers such as the e-Business Register, Land Register and Population Register, e-Health initiatives such as e-Prescription and Electronic Health Records, and a State e-Services Portal. Smaller scale solutions include DigiDoc, e-Cabinet, e-Police, e-Tax, e-Law, e-School, Internet Voting, m-Parking, mobile-ID, m-Payment, location based services for rescue workers, and social welfare e-Services.

- In the UK, until recently, electronic services were implemented in a centralised manner. Budget cuts has resulted in a very decentralised way of implementation, spurring questions of where to invest. Focus in the UK has been on the rollout of broadband internet and on the development of centralised portals. The G-Cloud and CloudStore focus on introducing cloud ICT services into government departments, local authorities and the wider public sector. About 50% of suppliers accepted for CloudStore were SMEs. Other e-Services include the NePP e-Procurement system, e-taxation, and the use of electronic services for law and order. The set-up of a National Health Record system faces considerable difficulties and is delayed.

- The Netherlands ranks second (after South Korea) on the UN e-government benchmark of 2012 and provides a wide range of electronic services. It does not use the term 'ubiquitous' as such, but includes its characteristics as part of its e-government strategy. Central to the current e-government i-NUP program are standardisation and interoperability of government registrations. Electronic services range from businesses and citizens' portals, the DigiD electronic authentication mechanism, the DigiPoort e-Procurement system, e-Tax system with prefilled forms, e-Customs and national patient records. Its Rijkscloud cloud computing system is implemented separately from the internet.

- Germany had policy frameworks for electronic services in place on three levels: the federal, state, and local level. This is reflected in the dispersed services development. On the federal level important policy frameworks are the setup of online registers for citizens, motor vehicles, and possession of firearms, as well as the investigation for solutions for national identification and authentication. Furthermore, on the federal level a number of portals are set up that provide an overview of electronic services, such as a federal information and knowledge management system, a public services register, a public authorities finder and a performance catalogue.

- Services development in Germany on the federal level include the e-identity smart card and the electronic job board. On the local level, the Friedrichshafen smart city (T-city) project implemented an array of smart services, including networked cars, telemedicine, smart metering, and several e-learning solutions.

- Cross-border operations are limited or non-existent. The attempts that have been made at Europe-wide interoperability are all struggling.

- When looking at the list of services provided, the front-runner Asian countries involved in this study and the front-runner EU Member States provide a similar range of services. While South Korean and Japan are investing heavily in infrastructure, especially for mobile phones, the focus of leading EU Member States ison the development of citizen-centered services.

- Based on the United Nations e-government survey, developments in South Korea, Estonia and the Netherlands are most impressive. They have in common a focus on infrastructure development. But while South Korea strongly focuses on an advanced physical infrastructure, Estonia and the Netherlands focus on the development of an e-government infrastructure around building blocks such as identification and authorisation mechanisms and vital registries.

- Compared to the developments in Asia, the developments in EU Member States are much less centrally developed, but often developments happen bottom-up. Compared to developments in the US and Canada, initiatives are more often led by EU Member State governments.

- Each of the initiatives discussed in this chapter functions in a single European Member State. Cross-border operations are limited or non-existent. The attempts that have been made at Europe-wide interoperability, all of which could be said to struggling, are discussed in Chapter 6.

- Different types of policies can be found in practice: those that are aiming for spill-over effects for example by providing information or 'nudge' rather than control, and policies that implement and control designed outcomes. While the latter are often found in the Asian countries, the former seem to be more often adopted by EU Member States.

3.1. Introduction

This chapter considers the scope and status of ubiquitous polices for the European Union and for selected Member States. Countries were chosen on the following criteria: (1) Large, federal and centralised systems to capture some of the additional challenges of decentralising eGovernment – Germany (federal) and the UK; (2) Small, established Member States – the Netherlands; and (3) Newer Member States – Estonia. Similar to the description of developments in non-EU jurisdictions, the country studies are described first by presenting the policy objectives and infrastructure, before moving on to mapping the services and developments. The chapter is concluded by providing an overview of developments according to their sector and by comparing the countries' initiatives according to a number of characteristics.

3.2.   Estonia

3.2.1.   Policy objectives

The 'e-Estonia' strategy is based upon the assumption that a successful introduction of e-services should be built on a decentralised, distributed system so that all components can be linked or added on a platform-independent basis. Centralised databases or systems should be avoided. Systems developed by the private sector are to be preferred. Small, efficient projects and flexible systems based on best practice technology are favored over large-scale development projects and innovative but venturesome new technology systems.

From the 1990s, the Estonian government supported the idea of a modernized public administration system based on ICT solutions. Estonia was one of the first countries to establish a Digital Signature Act (2000). Initiatives like a secure infrastructure ('X-Road', 2001), e-Identity Cards (2002) and a mobile ID-system established a solid platform for further development of e-government and business solutions.

Exporting public services has encountered significant obstacles in the form of local organizational and institutional environments. Consequently, one of the commercial services in Estonia – 'm-Parking'[111] – can be seen as the widest spread service. Standardising the ICT platforms internationally could facilitate technology transfers to other countries, in the opinion of Estonian e-Society initiators: "If there is one thing that could really help to spread e-services to other countries in Europe and the world, it is a common platform — such as the EU interoperability platform for e-ID." By establishing a Nordic-Baltic cooperation in ICT issues, they try to create an "example for the rest of the world to draw from"[112].

From early on, the e-Estonia strategy was flanked by programmes to enhance ICT skills and literacy. One was called the 'Tiger Leap project'[113], which among other training courses offered internet and computer training in schools. The 'Look at the world' project[114] focused on communicating very basic skills for the whole population, especially for the elderly or for less formally trained employees. This political approach of inclusion facilitated acceptance among all potential user groups. In addition, internet access prices were subsidised by the government in the 1990s so that citizens could use the new services for low fees, even in remote rural areas. The government also established internet access points for everyone in village centres or libraries.

E-Estonia can be described as a project that is ubiquitous; however, the term ubiquity is not actively used. Four goals of the overall 'ubiquitous' strategy are to be particularly stressed: 1) giving inexpensive internet access to the whole population, 2) digitalising data that is necessary for government services, 3) formalising and standardising exchange between these data bases, and 4) introducing a digital identity.

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[111] e-Estonia: m-Parking, http://e-estonia.com/components/m-parking.
[112] e-Estonia (2013) 'Top 5 Technology Transfers from e-
    Estonia', 28 March, http://www.ifg.cc/index.php?option=com_content&task=view&id=42882&Itemid=93.
[113] Tiger Leap Foundation, http://www.tiigrihype.ee/en.
[114] Look@World Foundation, http://www.vaatamaailma.ee/en/.

3.2.2. Technological aspects

X-Road

Established in 2001, X-Road is the backbone of e-Estonia as it equally solves infrastructural and standardisation problems. The X-Road data exchange layer offers a platform-independent secure standard interface to connect databases and information systems of the public sector. By implementing X-Road, the aim to store each data item only once could potentially be achieved, an important prerequisite to acceptance in the field of data protection issues in Estonia[115]. The SOAP (Simple Object Access Protocol) architecture of X-Road allows the implementation of all kinds of web services for the use of citizens and enterprises in Estonia. The X-Road environment was expanded to send all kinds of XML-format electronic documents securely over the Internet as it is at the same time a public key infrastructure (PKI).

One of the key elements of e-Estonia is that its databases are decentralised. The platform is controlled by the government. Government agencies or businesses can choose from the offered solutions, and services can be added one at a time. X-Road is the connection between databases of government institutions and enterprises offering public service or business solutions. All Estonian e-solutions that use multiple databases use X-Road.

X-Road can be used not only for making queries to the different databases, but also to write to multiple databases, transmit large data sets, and perform searches across several databases. In a larger sense, X-Road can be described as an early example of a "public cloud" offered to all public authorities, businesses, and citizens. 800 organisations, public registers and databases are connected to X-Road today. In 2011, X-Road services were used more than 24 million times. The service is accessable via fixed and mobile lines. Noteworthy is the ability to use basic services like e-ID from a mobile device.

Implementation and maintenance of the X-Road structure which is the central basis for security, functionality, and ease-of-use aspects is given to an government agency with support from a university research institution, the Estonian Informatics Centre (RIA), a subdivision of the Ministry of Economic Affairs and Communications. They are supported by service providers, consumers associations, application service providers and authentication service providers. X-Road may be also described as an early example of a 'platform-as-a-service' cloud service inasmuch as application developers can develop and run their solutions on X-Road; however, information is kept in a particular database. The technical environment is kept open to perpetual modifications and can keep pace with changing demands, for example if the need for a specific service ends.

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[115] Data that is stored only once and compiled only if necessary for special services can be more easily controlled. Every citizen in Estonia has the means and right to make inquiries about the storage and usage of their personal data. If errors occur, complaints can be filed with the data protection authority. Experts see this as a framework requirement for trust in the system and hence acceptance.

3.2.3. Services

The main services developed in Estonia are listed in Table 8.

Table 8:   Estonia's main ubiquitous services

Year	Name	User group	Main features	Basic access requirements
2005	DigiDoc	Public sector, courts, municipal contracts, banking industry, all areas of business	System for storing, sharing and digitally signing documents	e-ID card or Mobile e-ID, internet access
2002	Digital Signature	Businesses and citizens	Enables secure, legally-binding, electronic document signing	PIN codes of the user's electronic e-ID Card, internet access
2007	e-Business Register	Businesses	Allows entrepreneurs to register their new business online (without ever having to go to a notary or government office)	e-ID card or Mobile e-ID, internet access
2000	e-Cabinet	Ministers of the government	Tool that the Estonian government uses to streamline its decision-making process	PIN codes of the user's electronic e-ID Card, internet access
2003	e-Law	Citizens	Allows the public to access every piece of draft legislation that has been submitted since February 2003	e-ID card or Mobile e-ID, internet access
2005	e-Police	Police officers	Involves two main tools: mobile workstation installed in each patrol car, positioning system that shows headquarters each officers' location and status	PIN codes of the user's electronic e-ID Card, internet access
2010	e-Prescription	Doctors, pharmacists, patients[116]	Centralised, paperless system for issuing and handling medical prescriptions	e-ID card or Mobile e-ID, internet access

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[116] Only accessable by someone with an Estionian eID, not open to other users (e.g. in case of emergency abroad).

Year	Name	User group	Main features	Basic access requirements
2002	e-School	Teachers, parents, students, district administrators (school authority)	Provides a way for education stakeholders to collaborate and organise teaching/learning information	PIN codes of the user's electronic e-ID Card, internet access
2000	e-Tax	Taxpayers (individuals and entrepreneurs)	Electronic tax filing system set up by the Estonian Tax and Customs Board	e-ID card or Mobile e-ID, internet access
2008	Electronic Health Record	Doctors, patients, ministries	System that integrates data from Estonia's different healthcare providers to create a common health record for each patient	PIN codes of the user's electronic e-ID Card, internet access
2002	Electronic ID Card	Citizens	Serves as the digital access card for all of Estonia's secure e-services	e-ID card or Mobile e-ID, internet access
2005	Electronic Land Register	Real estate/ land buyers and sellers, businesses	Web application that contains information of all ownership relationship and limited real of real estates and land parcels	PIN codes of the user's electronic e-ID Card, internet access
2005	i-Voting (Internet voting)	Voters	System that allows voters to cast their ballots from any internet-connected computer, anywhere in the world	e-ID card or Mobile e-ID, internet access
2000	Location-Based Services[117]	Rescue workers, citizens, police, tourism authorities, statistics agency and businesses.	Any service that can determine the location of a mobile device, and then provide information based on that location	PIN codes of the user's electronic e-ID Card, internet access
2000	m-Parking (Mobile Parking)	Drivers	Drivers pay for city parking using their mobile phones	e-ID card or Mobile e-ID, internet access

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[117] In the public sector, positioning services are used by police and rescue teams, tourism authorities and the statistics agency. In the private sector, managers can log onto a website and see exactly where the organisation's trucks are at any given time.

Year	Name	User group	Main features	Basic access requirements
2002	Mobile Payment	Clients/ passengers	Allows customers to pay for goods and services using their mobile phones in place of credit cards	PIN codes of the user's electronic e-ID Card, internet access
2007	Mobile-ID	Citizens	Service that allows a client to use a mobile phone as a form of secure electronic ID	e-ID card or Mobile e-ID, internet access
2001	Population Register	State (statistics bureaus) and residents	State's database holding basic information about each person living in Estonia	PIN codes of the user's electronic e-ID Card, internet access
2011	Smart Grid in Energy Sector	Distributors, consumers	Allows end users to monitor their consumption in real time, compare the various packages available to find the best deal, and choose how much of their energy will come from renewable sources	e-ID card or Mobile e-ID, internet access
n.a.	Social Welfare e-Services	Applicants	Online social welfare benefit system	PIN codes of the user's electronic e-ID Card, internet access
2003	State e-Services Portal	Citizens, entrepreneurs, officials (divided into different sections – one for citizens, one for entrepreneurs, and one for officials)	Central online portal for the different e-Services offered by various government institutions	e-ID card or Mobile e-ID, internet access
2001	X-Road	e-Estonia	Underlying platform that allows the nation's various e-services databases, both in the public and private sector, to link up and cooperate	PIN codes of the user's electronic e-ID Card, internet access

Source: e-Estonia.com (n.a. = data not available).

Two examples of electronic services in Estonia are the Electronic ID Card and the electronic Tax system.

Electronic ID Card

In 2001 the Parliament established ID-card as a compulsory identity document to replace the old identification system from Soviet times. The first ID-cards were issued to Estonian citizens in 2002. By 2005, over 50% of the Estonian population owned an ID-card[118]. The ID-card project uses the digital signature, which was established in 2000. The certification of the ID-card includes a personal identification code, which enables identification of the user. This identification feature can be used to do online transactions, e.g. in the field of banking or shoppging. Furthermore, a certificate, which enables the user to sign documents with the same legal implications as a handwritten signature, is inserted in the ID-card chip. Both certificates inserted in the ID-card can be applied in the public sector as well as between enterprises and between individual private users.

As the bank sector promoted the e-ID card from the beginning, it offers real advantages in usage for almost everyone. Full bank transfer service, for example, is most convieniently done with e-ID security. Users of telephone banking or branch services have to accept higher costs or reduced features. In 2007, the banking sector gave up all activities to develop other identification schemes besides the e-ID on its own. Although Estonia is not the inventor or originator of e-ID, experts emphasise how in the Estonian society and economy the functionality of the card is used to its fullest. A citizen pays 20 euro for an e-ID Card (EUR 10 for the Identity Card and 10 euro for the e-identification functions). There are no per-use fees. The initial e-ID implementation as a whole was tax-funded. The respective service providers bear the costs per transaction.

e-Tax

The Estonian Tax and Customs Board has established an electronic tax filing system via X-Road and e-ID-Card in 2000. In 2002, automated tax declaration forms were introduced. According to government authorities, the e-tax solution has severely reduced resources on all sides needed to file taxes. The use of the web-based application typically takes not more than five minutes[119].

The simple process is standardised as follows:

- The taxpayer logs onto the system by Using a secure ID;

- reviews pre-filled tax forms and makes necessary changes; and

- signs the approved data.

In addition to individual tax returns, other declarations can be made in the system, e.g. enterprise's declarations for income tax, social tax, unemployment insurance and contributions to mandatory funded pension; Value-added tax returns; alcohol/tobacco/fuel/packaging excise duty returns; customs declarations, and more.Experts claim that e-tax saves Estonian companies an average of EUR 7 per each income and social tax declaration.

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[118] Kalja, A. (2005) 'eGovernment in Estonia: Best Practices', Inst. of Cybernetics at Tallinn Univ. of Technology, Aleksander Reitsakas, Niilo Saard, Cell Network Ltd., PICMET.

[119] Information on e-tax and access to services is provided via http://e-estonia.com/components/e-tax.

3.3. UK

3.3.1. Policy objectives

Until recently, the UK governance system was regarded by many as very centralised with local governments receiving grants from the central administration and the central administration being responsible for many public services (including healthcare). This picture has changed dramatically as many public expenditure programmes were drastically reduced. This inhibited both public and private investment in the components of a ubiquitous digital economy (from infrastructure to services). Although more resources were channeled to infrastructures control over specific systems changed irreversibly. For instance, while the chief 'hubs' of centralised control over the healthcare system (the Strategic Health Authorities and Primary Care Trusts) are being dismantled, commissioning, and therefore many healthcare decisions, have been devolved to local consortia of general practitioners. This has had a knock-on effect on some key drivers of ubiquitous policy, such as the (latest attempt at an) initiative to provide a ubiquitous information structure for the National Health System. The UK has a high degree of flexibility in its budgeting process, and a high degree of authority is given to the administration to make changes to budgeted resources halfway through the fiscal year[120].

The main players driving ubiquity in UK policy are the Cabinet Office (hosting the Government Digital Service dedicated to realising the government's own digital strategy), the Department for Culture, Media and Sport, the Department for Business Innovation and Skills (which is in charge of the Braodband Strategy), and Ofcom, the independent regulator. In this respect, it should be noted that the concept of ubiquity – of having a uniform 'floor' level of services and policy protection throughout the UK – has been one casualty of recent austerity measures. There have been calls to roll back (and means-test) many universal benefits, and even the allocation of funding for improvements to the broadband infrastructure has been highly selective.

This does not mean that ubiquity does not remain an important long-term objective. Rather, the 'seeding' of development by targeting specific areas, demographic groups and sectors in order to encourage the take-off of a private-sector-driven march to ubiquity is seen as most cost-effective. This has led to an important debate over targeting. When improving the broadband infrastructure, is it better to improve the service in economically-productive areas where business take-off is more likely (and the economic returns are greater in the near- to medium-term (i.e. urban areas in the South), or to target those in greatest need, with least willingness (ability) to pay and the most uncertain and remote economic prospects (i.e. those the private sector does not already plan to serve)?

The Digital Agenda paper called for the UK Government to take a leadership role in preparing a wide ranging digital strategy for the country. 'Digital Britain'[121] acknowledged that the government had an impact upon the digital economy and developed the government's vision for the UK to boost its digital economy terms of its role in delivering public services and market influence as well as enabling cost savings and providing an investment framework for research and development (although criticised for being too ambitious and at the same time not providing sufficient detail on operationalisation)[122]. It led to the adoption to a series of initiatives and legislation were adopted. For instance, the

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[120] OECD (2009) 'Government at a Glance: Country Note for UK', Paris, http://www.oecd.org/gov/47876677.pdf.

[121] Department for Business Innovation & Skills (2009) 'Digital Britain Final Report', June, www.official-documents.gov.uk/document/cm76/7650/7650.pdf.

[122] Sharif, L. & Ahmed, M. (2011) 'An Evaluation of the Digital Britain Report', TRIM 7(1), Jan-June http://ojs.uok.edu.in/ojs/index.php/crdr/article/viewFile/95/84.

controversial Digital Economy Act[123] aimed to foster growth through measures including spectrum and domain name regulation as well as acting against online IPR infringements. It survived intensive challenges by incumbent operators (among others) and its implementation continues to be delayed, ostensibly for reasons of cost[124].

Strategies

Successive UK governments have pursued an ambitious programme of development of ubiquitous services, in close conjunction with policies intended to extend the ICT infrastructure and to stimulate business and civil society activity in the online environment. Currently, this complex of strategies is represented by the infrastructure programme outlined in the Broadband Britain strategy document, the 'back-office' strategy contained in the National Programme for IT and the vision for ubiquitous and green e-government services detailed in the Government ICT Strategy. However, few of the current activities originate wholly within these strategies. To provide historical context and an overview of the parties involved (on the government side) and objectives addressed, Table 9 provides a timeline of key government initiatives providing support for the deployment of uniquitous e-services. Many of these initiatives contain multiple specific actions, some of which are discussed in more detail below. The table gives the date of initiation, the responsible body and a brief description.

Table 9:   UK initiatives and policies related to ubiquitous services

Year	Initiative	Responsible	Content
2003	Government: Supporter and Customer?	Better Regulation Task Force	Review recommended tackling barriers to small- and medium-sized enterprises in government procurement, including ICT procurement
2004	Update to the policy for the use of Open Source Software	Cabinet Office	Update relating to government's research and development projects
	UK National Broadband Strategy	Department of Trade and Industry	Strategy for delivering better broadband provision in the UK
	Enabling a Digitally Inclusive United Kingdom	Digital Inclusion Panel	Review recommended that online government services are accessible to all
	Releasing resources for the frontline: Independent Review of Public Sector Efficiency	OGC - Gershon Review	Report identified £20 billion efficiency savings between 2004-05 to 2007-08, including specific savings from more modern ICT

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[123] See, for instance, McKeown, P. (2012) 'The Digital Economy Act 2010: Why the UK's Graduated Response System to Counter Online Copyright Infringement Should Be Repealed', http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2012818.

[124] MusicWeek (2013) 'Digital Economy Act delayed again', 7 February, http://www.musicweek.com/news/read/digital-economy-act-delayed-again/053507.

Year	Initiative	Responsible	Content
2005	Government appoints first Government Chief Information Officer		Appointment aimed to focus ICT's potential to transform service delivery and improve operational efficiency. Role replaced that of the e-envoy, whose task was to get the UK online
	Chief Information Officer Council formed		Council brought together chief information officers from across the public sector to address common ICT issues
	Freedom of Information Act 2000 came into force		Legislation gave citizens the right to access government information
	Connecting the UK – the Digital Strategy	Cabinet Office and Department of Trade and Industry	Strategy to increase access to online services
	Transformational Government – enabled by technology	Cabinet Office	Strategy for greater use of technology delivering government services, and designing those services around the needs of citizens
2006	Service transformation: A better service for citizens and businesses, a better deal for the taxpayer	The Varney Review	Report recommended improving public services using new technology and greater joining up of services across departments
2007	Digital Inclusion Landscape in England	Digital Inclusion Team	Research into the scale and impact of citizens who can't access the Internet
	Understanding Digital Inclusion	UK Online Centre	Action plan to increase access to online services

Year	Initiative	Responsible	Content
2008	Power of Information Taskforce set up		Taskforce to advise the Government on making better use of state-and citizen-generated information, and adapting to greater use of the Internet
	Delivering Digital Inclusion – An Action Plan	Department for Communities and Local Government	Action plan to increase public access to online services
	Accelerating the SME Economic Engine: through transparent, simple and strategic procurement	HM Treasury	Report recommended tackling the barriers to small-and medium-sized enterprise's access to government procurement
	VFM Savings Programme	HM Treasury	Government wide savings programme for 2008-09 to 2010-11
	Data Handling Review	Cabinet Secretary	Review of government's policies for data handling following high profile data losses in 2007
2009	Operational Efficiency Programme	HM Treasury	Report identified £3.2 billion savings in operational spending on ICT across government.
	Open Source, Open Standards and Re-use: Government Action Plan	Cabinet Office	Strategy for government to increase its use of Open Source Software.
	Digital Britain Report	Department for Business, Innovation and Skills and Department for Culture, Media and Sport	Digital economy strategy. Ubiquitous elements include Directgov (citizen portal), Business.gov (business service portal) and Government Gateway (unified infrastructure)
	Putting the Frontline First – Smarter Government	Chief Secretary top the Treasury	Wide-ranging report set out plans to increase government efficiency and effectiveness, for example, by getting more people online, or benchmarking ICT costs.
2010	Government ICT Strategy – Smarter, Cheaper, Greener	Cabinet Office	Cross-government strategy to deliver savings on ICT, for example through reducing duplication and greater standardisation. 30 specific actions.
	Directgov and beyond (the Fox review)	UK Digital Champion	Review establishing 'digital by default' strategy

Year	Initiative	Responsible	Content
2011	Government Digital Service	Cabinet Office	Office established to oversee transformation of digital services (esp. Digital by Default strategy) across 24 Departments
2012	Broadband Delivery UK (BDUK)	Department of Culture, Media and Sport	Ubiquitous high-speed broadband infrastructure
	Future Cities	Technology Strategy Board	Smart Cities pilot programme, including service and infrastructure transformation; coordinated with hyperconnected cities aspect of BDUK.
Ongoing	Consolidated portals		Directgov is the primary resource for citizen services
			Businesslink supports business services and applications
			NHS Choices disseminates information about conditions, treatments, local services and healthy living

Source: This is adapted from the National Audit Office (2011a) 'Implementing the Government ICT Strategy: six-month review of progress', Report by the Comptroller and Auditor General HC 1594 Session 2010–2012, London: The Stationery Office, with additional material from other public sources.

3.3.2.   Technological aspects

Broadband

According to the UK regulator and competition authority Ofcom[125], in 2012 76% of UK adults had broadband access (13% of them with access to mobile broadband)[126] as approximately the same fixed broadband take-up, at 32 connections per 100 people, as France and Germany. Superfast (> 38 Mbps) broadband coverage in 2012 had reached 65% of UK premises[127], also comparable to Germany. However, the number of ultra-fast (> 100 Mbps) connections meeting the targets of the Digital Agenda for Europe still remains relatively small in the UK. It is important in interpreting these numbers to take market conditions into account; this is why most Universal Service Obligations (one aspect of ubiquity) stipulate affordability as well. BT remains in many senses the dominant incumbent; despite the fact that it only directly supplies 30% of fixed-line broadband subscriptions (see below for further discussion) the bulk of its competition comes from resellers of its wholesale (OpenReach) product and most of its unbundled local loop access is Bitstream.

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[125] BT expects to achieve 70% coverage of VDSL by Spring 2014 (and is already close to that target). With government subsidies, they expect to reach around 90% coverage of FttC (superfast) broadband by 2017 or so.

[126] Ofcom (2013) 'Report for Government on Broadband progress', March, http://media.ofcom.org.uk/2013/03/05/report-for-government-on-uk%E2%80%99s-broadband-progress/.

[127] This is likely to pass 90% by 2017, providing that there is not too much overlap between FttC and cable overlap. There isd an important trade-off between ubiquity in the sense of covering the whole population and affordability, because prices are higher in the absence of facilities-based competition (e.g. FttC vs. cable).

From the standpoint of ubiquity, therefore, coverage and the technical peak-speed capability of the broadband provision may be less important – at least in terms of enabling and encouraging the development, deployment and uptake of ubiquitous applications and higher-level; services – than affordability and competition between suppliers who may seek market share by offering such services. BT is keenly aware of its power and tries hard to preserve it. It keeps competition from resellers under control; note the recent TalkTalk case alleging margin squeeze against BT resale (being investigated by Ofcom). It also controls the speed at which it is improving its broadband networks, knowing that application and service-based competition from resellers becomes more threatening as the quality of the wholesale broadband improves.[128] For this reason, and taking into account the much higher capital costs of ultrafast broadband (FTTP), BT has dropped its FTTH (330 Mbps) plans in favour of FTTC (up to 40 Mbps);[129] both count towards the UK universal coverage target[130] (not the DAE one) but FTTC is cheaper and less risky from a competition standpoint.

The UK's communication markets were opened with the privatisation of BT in 1984 and the introduction of competition. According to Ofcom, the UK broadband market is relatively competitive within the EU, with the proportion of fixed lines operated by the incumbent BT at 30% being the lowest in the EU and continuing to decline (with Talktalk, Virginmedia and Sky following, with market shares around 20%)[131] and the market share of the largest mobile operator EE at 33%. Regulated Next Generation Access (NGA) products, however, have met limited take-up by companies other than the incumbent.[132] The UK is a front-runner in implementing regulatory remedies such as Virtual Unbundled Local Access (VULA) that allows competitors to deliver services over BT's NGA network. The UK also had relatively low prices for fixed and mobile broadband relative to the major EU economies.

There has been strong recent investment in superfast (as distinct from ultrafast) broadband. The cable operator (Virgin, which was the first UK operator to provide speeds in excess of 50 Mbps) was already providing 'up to 100 Mbps' to over 4 million UK homes by June 2011; within 8 months this had grown to 10 million homes. BT has continued to implement its own plans to invest some 2.5 billion pounds (3 billion euros) in fibre – although as noted above it has dropped the faster FTTP part of this programme. By November 2011, its FTTC network passed some 6 million homes.[133] This infrastructure improvement is reflected in data on available broadband speeds. Investment by operators is confirmed by the statistics on broadband speeds. According to EU data, the share of high-speed lines (at or above 10 Mbps) had increased to 73.1% by the start of 2012, compared to an EU average of 48.4%, with no lines offering headline speeds below 2 Mbps). However, this increased performance stops well short of the DAE targets for ultrafast (> 100 Mbps) broadband. The UK has one of the smallest shares of ultrafast broadband (0.02% at the start of 2012, significantly below the EU average of 0.4%). Even in the middle range (> 30 Mbps), the UK only has a penetration rate of 1.7% (vs. 2.4% EU average).

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[128] This is because the QoS or QoE a rival can offer is better if they can buy higher bandwidth and greater reliability and technical QoS.

[129] Uswitch (2013a) 'BT scraps original target for FttP broadband coverage', http://www.uswitch.com/broadband/news/2013/04/bt_scraps_original_target_for_fttp_broadband_coverage/.

[130] Uswitch (2013b) 'FttC more viable for universal coverage says BT', http://www.uswitch.com/broadband/news/2013/04/FttC_broadband_more_viable_for_universal_coverage_says_bt/.

[131] Think Broadband Factsheet (2013) 'Q1 data', http://www.thinkbroadband.com/factsheet/broadband-factsheet-q1-2013.pdf.

[132] Digital Agenda Scoreboard, UK country profile, https://ec.europa.eu/digital-agenda/en/scoreboard/united-kingdom.

[133] It is not known how many of these lie within the coverage of the Virgin ultrafast offer.

3.3.3. Services

G-Cloud

The 'G-Cloud' Programme is a cross government initiative led by the Ministry of Justice and supported by the Home Office under the direction of the Chief Information Officer Delivery Board as part of the Government ICT Strategy. It aims at transforming government services through "rationalising the government ICT estate, using cloud computing to increase capability and security, reduce costs and accelerate deployment speeds"[134], remaining in the spirit of the previous Transformational Government Strategy produced in 2005. The initial focus is on introducing cloud ICT services into government departments, local authorities and the wider public sector. In order to do this, the programme has created a G-Cloud procurement framework for services under the Official Journal of the European Union (OJEU) process, publishing an 'Invitation to Tender' (ITT) and selecting a limited number of suppliers. A notable explicit objective was to involve SMEs as potential suppliers to Government, and about 50% of suppliers accepted for CloudStore for the initial framework contract were SMEs[135]. At present there are four categories of services offered by a total of 460 enterprises: Infrastructure, Software, Platform and Specialist Services.

The G-Cloud initiative also underpins several other strands of UK ICT strategy, including:

- Data Centre Strategy: rationalising down the 500 data centres used by the government, policy forces and local authorities to 12 highly secure centres.

- Government Applications Store (Cloudstore). A marketplace for the sharing and reuse of online business applications on a pay by use basis, intended to reduce software costs across the public sector and speed up procurement.

- Shared Services. By 2020, the G-Cloud and Cloudstore will together meet the internal business needs of most public sector organisations, while many back-office business activities will have been commoditised and made accessible to all public sector organisations and employees via an online portal. While the UK G-Cloud strategy appears to suggest implementation of a monolithic public sector cloud, adoption of cloud computing in the UK has previously been on a regional basis, by organisations including town councils and regional police constabularies[136].

The G-Cloud, together with the Cloudstore is supposed to enable a total of 180 million pounds (over EUR 200 million) before 2015, while the consolidation of the Government Data Centres is projected to enable 160 million pounds (185 million pounds) in savings in the same timeframe[137]. However, while positive testimonials exist[138], it has been criticised for an overwhelming focus on technology and a lack of clear causality between the strategy itself and obtaining its goals[139]. Furthermore, the limited value of contracts awarded through

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[134] Cabinet Office (2011) ICT for Government Strategy, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/85968/uk-government-government-ict-strategy_0.pdf.

[135] Chant, C. (2012) 'Stand (Up) And Deliver – Can SMEs Handle It', G-Cloud blog, 24 February, http://gcloud.civilservice.gov.uk/2012/02/24/stand-up-and-deliver-can-smes-handle-it/. The G-Cloud programme was also cited as a case study showing success in encouraging government procurement from SMEs, Cabinet Office (2012) 'SME Case Studies – celebrating SMEs winning government business', https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/61389/Summary-of-Case-Studies.pdf.

[136] RAND Corporation, 2010.

[137] HM Government G-Cloud: Savings, http://gcloud.civilservice.gov.uk/about/savings/.

[138] Kahootz (2012) '2 years on - where has the UK G-Cloud got us?', http://in.kahootz.com/blog/bid/234436/2-years-on-where-has-the-UK-G-Cloud-got-us.

[139] Hon, W.K., Millard, C. & Walden, I. (2012) 'UK G-Cloud v1 and the Impact on Cloud Contracts', Communications Law, Part 1 17(3), p. 78; Communications Law, Part 2, (forthcoming), http://ssrn.com/abstract=203855.

the G-cloud (7.4 million pounds, or EUR 8.5 million, in the first year) and doubts about scalability have been objects of criticism[140]. Nonetheless, the government plans on progressively replacing existing IT contracts with cloud based ones and reaching 120 million pounds (EUR 140 million) by 2015.

NePP

The National e-procurement Project (NePP) for the UK was launched in October 2002 involving central and local governments. It is supported by an e-enablement strategy which underpins the sourcing, procurement and management of centralised deals and suppliers as well as supporting reporting and analysis of spend to effectively monitor and manage compliance[141].

ICT in the National Health Service (NHS)

The National IT Programme in the NHS is specifically intended to change the way information is used in the provision and management of healthcare services. It involves a

inality detection"[142]. range of services including Choose and Book (providing patients control of doctor and hosial appointments), e-prescribing, and the NHS Care Records Service, including both detailed and summary electronic patient records; these are being developed and delivered by a network of strategic private sector providers. The initiatives are delivered over a dedicated infrastructure and service layer, which includes services such as secure email (NHSmail), a bespoke broadband network (N3) and a suite of specific applications supporting the NHS Care Records Service (the Spine). While most of these elements are up and running, evaluations by the UK's National Audit Ofice[143] and the Major Projects Authority[144] show that uptake and utilisation are lagging and that some delivery problems have yet to be solved.

e-taxation – Her Majesty's Revenue and Customs (HMRC)

The UK has had online tax filing since 2000, which by 2003 covered four major taxes (Income Tax Self-Assessment, Value-Added Tax, Corporation Tax and income tax collections via the Pay-As-You-Earn (PAYE) system). A 2006 review by Lord Carter[145] found that tax filing was among the most advanced and complete of UK e-government services, but that uptake was disappointing. That review recommended that HMRC should provide universal and mandatory in-year electronic filing of business tax returns (Value-Added Tax, Corporation Tax and PAYE) and that all individual tax returns should be (optionally) fileable online by 2012. A 2011 Report by the UK's National Audit Office[146] found that this programme had largely succeeded, with improved takeup rates and reduced costs, though citizen and business benefits were as yet unclear. Recently, the PAYE filing system has been extended to allow real-time (rather than fixed-schedule) reporting, in order to

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[140] Public Technology Net (2013) 'Policy Maker: G-Cloud programme director Denise McDonagh and the need for the Public Cloud mandate', 3 March, http://www.publictechnology.net/features/policy-maker-g-cloud-programme-director-denise-mcdonagh-and-need-public-cloud-mandate/37622.

[141] Government Procurement Service, http://gps.cabinetoffice.gov.uk/about-government-procurement-service/training-and-recruitment/eprocurement-programme.

[142] Departmental narrative to Major Projects Authority, https://www.gov.uk/government/publications/home-office-major-projects-portfolio-data-2013.

[143] E.g. National Audit Office (2011c) 'The National Programme for IT in the NHS: an update on the delivery of detailed care records systems', Report by the Comptroller and Auditor General HC 888 Session 2010–2012, London: the Stationery Office.

[144] See Annual Report data for the Department of Health:https://www.gov.uk/government/publications/government-major-projects-portfolio-data-for-department-of-health-2013--2.

[145] HM Revenue and Customs (2006) 'Review of HMRC Online Services (Carter Report)', London: HMRC.

[146] National Audit Office (2011b) 'The expansion of online filing of tax returns', Report by the Comptroller and Auditor General HC 1457 Session 2010–2012, London: the Stationery Office.

accommodate the needs of SMEs and a labour market increasingly affected by short-term and part-time employment.

Borders and law enforcement – Home Office initiatives

The Home Office has a range of initiatives aimed at providing ubiquitous identity and record-keeping services, to internal law enforcement, border authorities and international law enforcement agencies. Current initiaives include: the Immigration and Asylum Biometric System (IABS, which records, stores and matches a range of fingerprint and other biometric data); the Emergency Services Mobile Communications Programme (ESMCP, which seeks to provide robust, biquitous and resilient communications services to the emergency services and other public bodies); UK participation in the Schengen Information Systems (SIS) II Programme (which stores and provides information on wanted and missing persons and lost and stolen objects on a pan-European basis); and 'eBorders' (which includes specific projects "aimed at establishing a modernised, intelligence-led immigration control framework, counter-terrorism support and crim

3.4. The Netherlands

3.4.1. Policy objectives

Although not integrated into one 'u-Government' policy (and not labeled as such), the Netherlands seems to make significant progress with the development and implementation of u-Government key building blocks. In the Netherlands, policies in the area of ICTs and government are still labeled as 'e-Government', yet they extensively cover the several key building blocks of what is called 'u-Government' (e.g. broadband, internet of things, RIFD, sensor networks). Policies on the specific enablers of ubiquitous government are dispersed over several ministries (e.g. Ministry of Economic Affairs develops policies on broadband and the Ministry of Internal Affairs on Cloud computing) and therefore one could not speak of 'one central' ubiquity strategy. Most important actors in e-government policy are Ministry of Internal Affairs and Ministry of Economic Affairs. Other actors play specific roles in development of specific ubiquitous government building blocks (e.g. Ministry of Infrastructure and Environment as regards the development and application of sensor technologies).

The Ministry of Economic Affairs launched the Digital Agenda in 2011[147], a policy document which sets out the ICT policy of the ministry between 2011-2015. The agenda consists of four action lines which focus on respectively 1) ICT enabled 'smart working' (administrative burden reduction, standardisation, cloud computing, access to open data), 2) fast and open infrastructure (high speed internet access and a free and open Internet), 3) trust in and security of ICTs (e.g. cybercrime, availability of networks, privacy) and 4) e-learning, e-skills and e-science. The Ministry of Internal Affairs published in 2011 the 'i-NUP'[148] (national e-government action plan), an implementation agenda for government services and e-government. Most important subjects of the agenda were 1) e-government for citizens (optimalisation of government e-services to citizens), 2) e-government for businesses (optimalisation of government e-services to businesses) 3) standardisation and interoperability of government registrations, 4) e-government support for municipalities. Focus is on administrative burden reduction, improved services, decrease of costs, increased application and use of e-services.

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[147] Digitale Agenda.nl – ICT voor innovatie en economische groei, http://www.rijksoverheid.nl/documenten-en-publicaties/notas/2011/05/17/digitale-agenda-nl-ict-voor-innovatie-en-economische-groei.html.

[148] iNup, http://e-overheid.nl/onderwerpen/e-overheid/over-i-nup.

According to the 2012 United Nations E-government Survey rankings, the Netherlands is the second world leader in the area of e-government, after South Korea and followed by the United Kingdom and Denmark[149]. In this survey, the Netherlands (amongst others) ranked high on the list of using multiple channels and platforms for service provision. The Netherlands was amongst the nineteen countries which use all channels (e.g. web, SMS, mobile apps, kiosks) for service delivery.

3.4.2. Technological aspects

Broadband

The Netherlands is amongst the top 10 countries with highest (high speed) broadband penetration. In a 2012 survey of the Broadband Commission[150], the Netherlands ranked fourth on the list of countries with fixed broadband in place and fourteenth on the list of countries with mobile broadband. In addition, the survey of the Broadband Commission revealed that in 2011 92.3% of the Dutch citizens regularly used the internet. A 4G mobile network has been available in the Netherlands from February 2013 onwards in Amsterdam and the northern part of the Randstad[151]. Mid 2013, around 50% of the Dutch citizens will have access to 4G services (of amongst others KPN). From 2014 onwards 4G will be available nation-wide.

Rijkscloud

In 2011, the Ministry of Internal Affairs commissioned an exploratory study on the pros and cons of cloud computing and the opportunities for a government cloud[152]. One of the conclusions of the Ministry of Internal Affairs based upon the study was that cloud computing could provide opportunities for the Dutch government in terms of easier and more efficient access to (large amounts) of data. However, the Minister of Internal Affairs stated that at that moment in time the disadvantages of a government cloud provided by existing cloud companies were greater than the advantages. Most of the reasons not to make use of cloud solutions provided by businesses were based on the immaturity of the cloud computing market and the high security levels the Dutch government requires for the protection of government data. The supply of closed cloud computing solutions which met the requirement of the Dutch government was very limited. In addition, the open cloud computing solutions did not meet the requirements of the Dutch government (which conclusion was also based on lessons learned in other countries). For instance, one requirement which was not being met by the cloud computing solutions was the level of privacy protection as set by the Dutch government.

The current strategy of the Dutch government is a first (limited) implementation of the so-called 'Rijkscloud' (government cloud) to further explore the most suitable form (and optimise the benefits) of closed cloud computing for government. The most important goals of this Rijkscloud would be to make more efficient use of technologies, to increase the accessibility for end-users and to lower (e.g. maintenance) costs. The Rijkscloud will be developed and exploited within a central government body and will provide services to all kind of government bodies (Uitvoeringsprogramma Compact Rijksdienst)[153]. The implementation of the Rijkscloud will be evaluated and based upon the evaluation the government cloud will be implemented more broadly. One of the main focal points of the

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[149] UN 2012.

[150] Broadband Commission (2012) 'The State of Broadband: Achieving Digital Inclusion for All', Geneva.

[151] KPN (2013) 'Supersnel G4: supersnel voor iedereen', http://www.kpn.com/prive/4G.htm?campaignid=ps599.

[152] Ministry of the Interior and Kingdom Relations (2011) Letter to the Parliament, 2011-2000097712.

[153] Vernieuwing van de Rijksdienst, TK 31490, nr.54, https://zoek.officielebekendmakingen.nl/kst-31490-54.html.

Dutch government is the extension of data storage and server/infrastructure capacity, aggregation and consolidation of datacenters.

Sensor networks

The Netherlands holds a strong position in fundamental sensor technology research[154]; however, compared to other countries (e.g. South Korea), the Dutch national government does not play a dominant role in the development and application of these technologies. So far, no central comprehensive public policy in this field has been developed by government bodies. Nonetheless, several government institutions have developed specific sensor based policies (e.g. Ministry of Economic Affairs on smart meters), or have substantially applied sensor technologies (e.g. police services in case of CCTV and ANPR). Also in semi-government organisations, such as hospitals, all kind of experiments with sensors are conducted (e.g. body area networks) and sensor networks have been applied.

In the Netherlands, the most important actors involved in sensor technology are technology firms, technical universities, research institutes and various bridging and networking initiatives. The Netherlands does not have a significant position in some industries that are of importance for sensor technology applications, such as the automotive and aerospace industry. However, other industries in which the Netherlands holds a strong position can also spur sensor technology development and application (such as transport and logistics, the process industry, the agricultural food industry, horticulture, medical systems).

Internet of Things

Closely related to sensor technology is IoT (Internet of Things) which refers to uniquely identifiable objects (often equipped with sensors, e.g. RIFD) and their virtual representation in and interconnection through an internet-like structure. Although the Dutch central government has not explicitly defined an IoT policy or strategy, government bodies (e.g. the Ministry of Internal Affairs) commissioned explorative studies on IoT or related subjects. In 2012, the Centre for Public Innovation for instance carried out a study on future internet, including IoT[155]. One of the conclusions in the research report was that "for most of the future internet trends, a shared and committed vision within the government will be soon superseded because of the high speed developments". In other words, the researchers question whether the government should focus on the development of a central vision on (amongst others) internet of things. One of the recommendations was to concentrate on preconditions needed to stimulate certain future internet developments.

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[154] Dittrich, K., Huis in 't Veld, M. & Stam, E. (2008) 'Sensor Technology in the Netherlands: Collaborating to turn knowledge into innovation?', Paper presented at the DRUID 25th Celebration Conference, Copenhagen. The The TU Delft – more specifically its research institute DIMES – belongs to the top sensor technology research institutes in the world.

[155] Center for Public Innovation (2012) 'Toekomstig Internet', Rotterdam: Erasmus University.

3.4.3. Services

Prominent electronic services in the Netherlands are mapped in Table 10.

Table 10:   Services in the Netherlands

Year	Initiative	Responsible	Content
2003	DigiD	BKWI (Bureau Keteninformatisering Werk & Inkomen)	Launch of the e-IDM system DigiD, back then called NAV (Nieuwe Authenticatie Voorziening).
2006	DigiD-plus	ICTU	Enhancement of the DigiD system with SMS authentication.
2009	National patient record	Ministry of Healthcare, Well-being and Sports	Introduction of a nation-wide system of patients' records. Start of implementation of the system.
	Prefilled tax retuns	Tax Administration	The Dutch Tax Administration receives third-party information which is used to pre-fill tax returns, which are digitally accessible for citizens.
2010	Home Care SenseNet	Universities, government and other parties	Sensor network project which aims to improve the quality of life of patients in need of care.
2011	The Digital Agenda	Ministry of Economic Affairs	ICT policy of the ministry between 2011 and 2015. The agenda consists of four action lines which focus on 1) 'smart working', 2) fast and open infrastructures, 3) trust and security of ICTs and 4) e-learning, e-skills and e-science
	i-NUP	Ministry of Internal Affairs and Kingdom Relations	National e-government plan, and implementation agenda for government services and e-government
	Rijkscloud	Ministry of Internal Affairs and Kingdom Relations	Cloud strategy, implementation of the Rijkscloud to further explore the most suitable form of closed cloud computing for government.
	Digipoort, e-Invoices	Ministry of Internal Affairs and Kingdom Relations	Launch of Digipoort through which businesses can submit their invoices.
2012	IoT exploration	Ministry of Internal Affairs and Kingdom Relations	Exploration of IoT and related subjects.
	Digipoort, e-Procurement	Ministry of Internal Affairs and Kingdom Relations	Expansion of Digipoort with an e-Procurement application, called DigiInkoop

Year	Initiative	Responsible	Content
2013	National patient record	Ministry of Healthcare, Well-being and Sports	After several changes to the system and the contract with the system developer CSC, the national union of general practitioners voted for the implementation of the system. The national electronic healthcare system currently contains 400.000 records.
	e-Customs, AGS	Ministry of Finance	Currently a new system for customs declaration, called AGS, is being implemented. The new system will further automate data traffic between involved parties. The new system will comply with the World Customs Organisation (WCO) Data Model, for cross border data exchange.

e-Procurement

Since January 2011, businesses can submit their invoices electronically through the government portal 'Digipoort'[156]. Digipoort is a central e-government platform on which governments and businesses can exchange data[157]. Examples of data which are being exchanged through Digipoort are financial reports, sickness notices, invoices and data on imported products. Since 2012, the Ministry of the Interior has been working on an expansion of Digipoort with an e-Procurement application (which is called 'DigiInkoop'). In 2012, 8 government bodies (Defense Ministry, Tax Administration and several departments of the Ministry of the Interior and Ministry of Infrastructure) started e-procurement through DigiInkoop. The nation-wide roll-out of the e-Procurement application DigiInkoop has been planned in 2013 and 2014.

Eid

The key e-ID system in the Netherlands is called 'DigiD', which is a username/password based authentication service. Digid is available in two formats for citizens; DigiD basic which consists of a username password combination, and Digid medium which contains an extra verification consisting of an sms token. In 2012, DigiD was used by around 10 million citizens and there were over 100 million DigiD supported transactions between governments and citizens[158]. In 2011 and 2012, there were several incidents which increased attention to the security of the DigiD service. In July 2011, systems of 'DigiNotar', the company that provides the certificates used for DigiD, were hacked, which led to a decline of trust in DigiD. In addition, DigiD suffered from DDoS attacks on several occasions. In April 2013, the Minister of Internal Affairs announced that the current DigiD system will be expanded with an additional security layer. This security layer consists of a chip based electronic identity card which will be launched in 2015.

Electronic patient record

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[156] Ministry of the Interior and Kingdom Relations (2013) 'Handleiding Aansluiten op Digipoort t.b.v. DigiInkoop/e-facturen', 15 April, Den Haag.

[157] Logius: DigiPoort, http://www.logius.nl/producten/gegevensuitwisseling/digipoort/.

[158] Ministry of the Interior and Kingdom Relations (2013) 'Visiebrief digitale overheid 2017', May, Den Haag, 2013-0000306907.

The use of electronic patient records by health care providers in the Netherlands is relatively high. Jha et al. who conducted an international comparative study on the penetration of electronic patient records came to the conclusion that four nations – the UK, Netherlands, Australia and New Zealand - had a nearly universal use of electronic patient records[159].

In these four countries the use of electronic patient records by health care providers was larger than 90%. Jha et al. examined rates of electronic health records use in ambulatory care and hospital settings, along with current activities in health information exchange in seven countries. However, although most of the healthcare providers in the Netherlands make use of electronic healthcare records, these records are not nationwide interoperable. Systems are often locally implemented which enables data exchange between a limited set of healthcare providers (e.g. local hospital, general practitioners, pharmacies).

This was one of the reasons for the Ministry of Healthcare, Well-being and Sports to introduce a nationwide electronic patient record system in 2009 (together with the Dutch association of care provider for health care communication VZVZ). This system is generally characterised as a decentralised system. Patient records are stored in the local systems used by the care professionals, who are responsible for managing and storing these records. Authorised nationwide access to patient records takes place through the 'National Switching Point'. This switching point contains a reference index which stores references (pointers) to patient records. Access control is managed in the national switching point, based on authorisation of the care professional for a given information category (e.g. general practitioners' record or pharmacy record). The patient data available through the national switching point consists mostly of professional summaries created by the healthcare provider for the purpose of sharing information with colleagues. Patients have to explicitly giver permission for the nation-wide exchange of (parts of) their data.

The implementation of the nationwide system faced various difficulties. The national union of general practitioners was reluctant to participate in the project as they indetified several serious disadvantages of the system. The first disadvantage pointed out by the national union of general practitioners was the fact that the system was being developed by CSC, an American company, which implies that the US government has the right to request (e.g. Dutch Healthcare) data of CSC under the US 'Patriot Act'[160]. The Patriot Act can force American companies to provide data to the US government, even if the daughter company and the computers are located in the Netherlands. A second disadvantage was the lack of an end-to-end authentication for patient record retrieval requests, making the system vulnerable to attacks on the national switching point. After several changes to the system and the contract with CSC, the national union of general practitioners voted for the implementation of the system in February 2013[161]. Yet the general practitioners who had voted against the nation-wide system stated that they would appeal to the courts as they are still convinced that patients' data are not sufficiently protected by the current system. The nationwide electronic healthcare system currently contains 400.000 patient records.

Home Care SenseNet

The Home Care SenseNet (HCSN) aims to improve the quality of life of patients in need of care and their care-givers. The HCSN exists of sensor nodes which are attached in private flats/houses and care institutions and make use of the existing broadband infrastructure. Small ad hoc mesh WLAN nodes, which require only a power outlet, provide the second

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[159] Jha, A.K., Doolan, D., Grandt, D., Scott, T. & Bates, D.W. (2008) 'The use of health information technology in seven nations', International Journal for Medical Information 77(12), pp. 949-954.

[160] Patriot Act, PUBLIC LAW 107–56—OCT. 26, 2001.

[161] NRC (2013) 'Huisartsen stemmen voor het EPD – nog lange weg te gaan', http://www.nrc.nl/nieuws/2013/02/05/huisartsen-stemmen-voor-het-epd/.

layer infrastructure connections that extend the reach of the network in large buildings (Lijden, 2010). The wireless sensor network monitors a part of the physical environment, physiological state, and current location of clients and (when needed) care-givers. The healthcare application uses the context data to detect significant events, alarm care-givers when appropriate and log data for long-term analysis, administration and accounting.

An example of a significant event which will yield a notification to a care-giver is when the smart surrounding detects that a client is still sleeping at 'normal' wake-up times or when a client has not taken his/her medicine. In case of emergencies (for instance when the client has fallen), the HCSN will use the location information to alert the closest care-givers (Lijden, 2010).

In the development of several building blocks for ubiquitous government and specific ubiquitous services, the Netherlands have faced (or are facing) problems as regards the coordination between several levels of government. In many instances, there have been discussions between government institutions on the 'ownership' and desired characteristics of services, which in some cases slowed down the development and/or implementation of the service. On the other hand, as ubiquitous services are often developed while applying an incremental approach, the involvement of businesses and citizens – and subsequent adoption by these parties – is relatively high.

e-Tax

In the Netherlands, electronic filing is used for citizens and business to fill in and file tax returns (personal income tax, corporate profits/income tax and value added tax). The whole process of handling the tax returns has been made electronic. Partially and (in some cases) fully completed tax returns are made available to taxpayers in electronic and/or hardcopy form. The Dutch tax authority receives third-party information (e.g. from banks, employers) which is used to pre-fill tax returns which are digitally accessible for citizens and business (together with data of the tax authority, such as taxpayer identity information and elements of taxpayer history). Citizens and businesses have to check the pre-filled tax return for inaccuracies, to add missing data if needed, and subsequently to sign the approved data electronically.

e-Customs

The Dutch Ministry of Finance is currently developing a new system for customs declarations, called 'AGS' (the project introducing the new system is called 'Vervanging Aangiftesystemen AGS')[162]. The new system will integrate and replace the several declaration systems currently in use by the Dutch Customs. The new system will further automate data traffic between involved parties and aims to reduce processing times and increase efficiency. Clients are already able to digitally submit declarations in the current system; however, the new system will also enable them (amongst others) to submit digital requests for extension of deadlines and to digitally file supplementary declaration(s). In addition, the new system will comply with the World Customs Organisation (WCO) Data Model, which is used for international data exchanges between businesses and government authorities (e.g. the National Single Window for Trade and Transport) and between separate government authorities. The AGS system for import (called AGS2) will be introduced in October 2013, and the AGS system for export (called AGS3) will be introduced in 2014.

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[162] Douane (Belastingdienst): AGS declaration system,
http://www.belastingdienst.nl/wps/wcm/connect/bldcontenten/belastingdienst/customs/reference_books_and_other_information/ags/.

3.5.   Germany

3.5.1.   Policy objectives

In Germany the IT Planning Council functions as a central body for cooperation in the field of ICT between federal and state level. The IT Planning Council was established in 2010 by a multilateral contract based on the German constitution. It displaced all former e-government working groups or committees and now steers all main e-services projects with overlapping federal and states relevance. Under the IT Planning Council's aegis several dozen e-services projects and a vast range of sub-projects are coordinated, financed and to some degree staffed. The state or one of the authorities in the 16 states takes the lead in a given project division (or in a single sub-project). In this way, the need for additional staff or new public authority structures could be minimised. Table 11 gives an overview of the main e-services projects[163].

Table 11:   Main electronic services developments in Germany

Initiative	Responsible (state/federal)	Characteristics	User groups
Online Registration Service (Overall project: Deutschland-Online Registry)	State	Measures to standardize the registration data and make them easier available	Public and private institutions
Civil Status Registry (Overall project: Deutschland-Online Registry)	Federal and state	Nationwide online Civil Status Register and development of standards for electronic data exchange	Public institutions and citizens
Motor Vehicle Registration (Overall project: Deutschland-Online Registry)	Federal and several states	Online registration platform for motor vehicles	Vehicles owner, agencies, insurers
National Firearms Registry (Overall project: Deutschland-Online Registry)	Federal and state	Standardised centralised, computer-based national firearms register	German and EU agencies

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[163] Projects with minor relevance respectively regional relevance exist on the level of the sixteen states and the local communities.

Initiative	Responsible (state/federal)	Characteristics	User groups
Further Development of the federal e-government infrastructure	Federal, public and private Computer Emergency Response Teams (CERTs)	Investigations for the further development of a commonly administrated federal infrastructure for interdisciplinary e-government processes	Public administration (federal, state, and municipalities)
Development of an overall strategy for identification and signature applications in e-government	Federal	Improve, organise and consolidate e-govermnent in the sectors identification, expression of intention, confidentiality.	Public administration
Improvement and harmonisation of information security	State	Development of a guideline for improvements in information security	Public administration (federal, states and municipalities)
Build up a federal information and knowlegde management	State	Creation of a sustainable and efficient infrastructure that involves information on administrative procedures	Public administration in all federal levels
Development 'Process data accelerator'	Federal	Development of methods and open standards for an Inter-process communication network to exchange data between economy and administration easily	Public administration and economy
Further development of modern citizen services	State	Investigations about the possible further modern access to public administration by citizens and businesses	Citizens and businesses
German public services register	Federal	Central platform for online services of the german public administration	Database for the use of public authorities services
Public authorities finder	State	Search engine for the services of all public administrarions	Citizens and businesses

Initiative	Responsible (state/federal)	Characteristics	User groups
Performance catalogue	State	Broad register of all administratitve services on all levels (of public administration)	atabase for the use of public authorities services
Governikus: middleware for electronic transactions in e-government	State	Secure and comprehensible data exchange via internet	Public administrations, citizens and businesses
D115: single telephone number for government agencies and offices	Federal	Nationwide service number that provides informations about all public administrations	Citizens and businesses

The above mentioned programmes can be described as project plans that are ubiquitous in themselves; however, the term 'ubiquity' is not actively used. Five goals of the overall 'ubiquitous' strategy are to be particularly stressed: 1) modernise public adimnstration to create benefits for businesses and citizens, 2) digitalise data that is necessary for government services 3) standardise and secure exchange between administration, citizens and businesses as well as within and between all government levels, 4) establish databases and information systems to facilitate all kinds of process organisation in government authorities but also in enterprises, 5) offer access to all e-services on multiple channels (online, by mobile apps, by phone, and so on, and also with regard to citizens with special needs).

3.5.2.   Services

e-Identity

The e-ID[164] is a function for a secure evidence of identity via internet. It offers a full electronic signature function as well as a simpler identification option for transactions like online shopping. The eID service hence authenticates and identifies the parties in e-business and e-government transactions. The e-ID is added to the regular identity card travel document which every German has to obtain from the age of 16 onward. E-ID cards for non-German residents in Germany are available. Besides the smart card, users (citizens, clients, whatever) must have an internet connection, a web browser, software ('AusweisApp') and the hardware to read the ID card. e-ID has been available since November 2010.

At the moment, there are serveral dozen applications, some still at an early stage, that integrate e-ID in various web services, e.g. services of government authorities, insurance services, and all kinds of online purchasing. Identification is for instance important when the 'Youth Protection Act'[165] states that buyers of certain products sold on the internet, such as video games, must have reached a certain age. It is assumed that e-ID will result in time-savings due to fewer visits to the authorities as there is no spatial proximity necessary

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[164] Bundesdruckerei (2013) 'eID-Service: Komfortables und sicheres Identitätsmanagement für Online-Diensteanbieter', http://www.bundesdruckerei.de/de/197-e-id-service.

[165] Bundesarbeitsgemeinschaft Kinder- und Jugendschutz, http://www.bag-jugendschutz.de/eng.html.

anymore to prove one's identity. Inasmuch as e-ID can be used by citizens as well as employees of enterprises, it offers a wide range of applications.

De-Mail

'De-Mail'[166] is a secure way to communicate with and within public agencies. It is based on internet mail communication but technically distinct. The users (citizens, agencies, and businesses) can exchange legally binding electronic documents over the internet. The required De-Mail accounts can be registered by certified companies (e.g. at the moment Deutsche Telekom or 1&1) and require identification of the applicant. The Ministry of Internal Affairs initiated the project in May 2011 in cooperation with private business partners with the object to reduce communication costs. In June 2013, the German E-Government Law (Gesetz zur Foerderung der elektronischen Verwaltung sowie zur Aenderung weiterer Vorschriften (E-Government-Gesetz)) established De-Mail as one of the options for secure electronic communication between public authorities and citizens or businesses.

Job board

The job board[167] of the German agency for employment serves as online platform for jobs and training positions. Applicants can search here systematically for job offers. Companies specifically select candidates for positions using this online service. If required, a search assistant informs the user automatically via e-mail about new positions online. To allow access to the labour market for everyone, the job board is available in six languages[168].

As registered users potential employers can create new job adverts and gain direct access to applications and candidate suggestions. A personalised mailbox allows direct communication with potential applicants. The job board is accessible via the internet, as well as via an app for smartphones. With 900.000 offers, 3 million applicant profiles and ca. 800,000 visitors every day it is the biggest online job market in Germany. Options for electronic searching for jobs have existed for approximately 25 years within the agency. The database first migrated to an online platform and later to the internet.

Smart City Friedrichshafen

Friedrichshafen is an example for the practical implementation of e-services in a smart city project based on existing technology and infrastructure (DSL, UMTS, WLAN-Hotspots). Friedrichshafen is a city in Southern Germany on the side of Lake Constance and belongs to the federal state of Baden-Wuerttemberg. Friedrichshafen has a population of approximately 58.000 inhabitants. Apart from tourism, aircraft construction is the main industry sector. In 2007, Deutsche Telekom started a unique experiment with its 'T-City Friedrichshafen' project[169]. Since then, more than 40 projects have been carried out. The project was recently extended to 2015.

In a public-private-partnership with the town council and by collaborations with citizens, the city administration, local businesses, clubs and organisations as well as hospitals and doctors project ideas for e-services – and also services with ubiquitous characteristics – are developed. T-City Friedrichshafen serves as a test facility for all kinds of services, e.g. secure e-mail, smart metering, intelligent networks, telemedicine, and e-government.

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[166] Bundesministerium des Innern (2013) 'De-Mail: So einfach wie E-Mail und so sicher wie Papierpost', http://www.bmi.bund.de/DE/Themen/IT-Netzpolitik/De-Mail/de-mail_node.html.

[167] Bundesagentur für Arbeit: Jobbörse, http://www.arbeitsagentur.de/nn_452852/zentraler-Content/A01-Allgemein-Info/A012-SIE-Betrieb/Allgemein/Startseite-Jobboerse.html.

[168] The job board exists for more than twenty years and is not a recent programme. Consequently, it plays no role in the current project list of the IT Planning Council (see table 10).

[169] Documentation of the whole project, including a project timeline: www.t-city.de.

Advantages for Deutsche Telekom are product development in close collaboration with customers from different sectors in a defined region. T-City projects are closely analised, which enables to get direct in-depth feedback from different user groups, such as public authorities and their employees, citizens, private user groups in households, and schools or health care environments.

Deutsche Telekom presumably expects to shorten invention and innovation cycles and to develop reference projects that can be then transferred successfully to a national level. The first five years of the project have been evaluated to gain a deeper understanding of the customers' requirements and requests and to get overall results from the scientific and market research for further ubiquitious services projects, e-services or smart city developments as a whole[170].

Technological aspects of Smart City Friedrichshafen

Households in T-City Friedrichshafen tested a networked 'smart home' control systemto see whether advantages in convenience, security and energy efficiency are achieved. To implement remote control for the home, the electricity network is connected to a broadband network. Every electrical appliance receives its own IP address and can thus may be contacted. Within the network, access is gained to windows and door handles or heating thermostats. Washing machines, driers or dishwashers switch themselves on when electricity is cheaper are made possible. The smartphone is used as a device to dim light, to let the TV display how much electricity the household is currently using or to switch on the burglar alarm while on holiday.

Smart solutions also bring ecological and economic benefits. Residents can keep track on their energy consumption. This could permit the saving of more than ten terawatt hours of electricity a year. This corresponds to the capacity of 10 to 15 large power stations[171].

Services in the Smart City Project Friedrichshafen

Specific services within the initiative include initiatives aimed at: enhancing mobility (networked cars); e-health (tele-medecine); smart metering; and e-learning (shared platform linking schools and 'Kindergarten online').

Networked cars - Deutsche Bahn cooperates with Deutsche Telekom in the 'Networked Car' project. The two companies have a strategic partnership for electro-mobility, car-sharing and fleet management to make travel planning more convenient. The initial project of Deutsche Bahn and Deutche Telekom had also begun as a pilot of electric vehicles linked to three networks in Friedrichshafen. Tests were carried out to find out how cars, trains and energy systems could be effectively linked to each other. Spontaneous rental of cars using a special smart phone app and transferral of data such as the range and power level of electric cars are realised. An intelligent meter in the charging station records the charging energy and creates the preconditions for, for instance, refuelling with regenerative energy. Electric cars serve as mobile energy storage units to help to offset oversupplies in the network, e.g. from photovoltaic systems or from wind turbines. Eventually, electrical car drivers and energy consumers will benefit from a smart energy network with flexible pricing models.

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[170] The findings of the evaluation project are published in: Hatzelhoffer, L., Humboldt, K., Lobeck, M. & Wiegandt, C.-C. (2012) 'Smart City in Practice – Converting Innovative Ideas into Reality', May, Bonn.

[171] WIK-Consult, Fraunhofer ISI, Fraunhofer ISE (2006) 'Potenziale der Informations- und Kommunikations-Technologien zur Optimierung der Energieversorgung und des Energieverbrauchs (eEnergy)', Studie für das Bundesministerium für Wirtschaft und Technologie, Bad Honnef.

In Friedrichshafen, also new concepts in mobility have been developed by the local university. Rental car users can stay connected using a smart phone app to inform the respective branch of a car rental company about their entire journey. For example, if someone arrives late because of a train delay, the rental service can re-schedule the rental car service. Furthermore, rental cars can be traced and their doors can be opened using smartphones.

Healthcare: Telemedecine - Deutsche Telekom intends to grow in the areas of electromobility and telemedicine and achieve revenues of one billion EUR by 2015[172]. To find new applications acceptable to potential users, Deutsche Telekom initiated in 2011 a three year helthcare project in the city of Friedrichshafen. The local hospital in Friedrichshafen cooperates via broadband networks with a hospital located outside of the Lake Constance region. Application areas include, for example, to ask for second opinions from colleagues when reviewing a patient's test results or meetings via video for tumor conferences. Teleconsulting is also implemented in homes. Using tablets, elderly people can post requests for domestic help, meals on wheels, or medicine easily. The project is limited to Lake Constance region.

Smart metering - T-City Friedrichshafen became the nucleus of Germany's smart metering projects. In the districts around the town, some 1.600 households have been equipped with smart meters. Mid-2009 the initiators started to implement a solution for electronic management of energy consumption data. Residents are able to read their electricity and gas consumption via a web application. Information about current consumption is sent to a data centre via DSL or a mobile connection. Consumption data is updated every fifteen minutes. Energy consuming equipment can be identified, electricity use evaluated overnight, and standby consumption quantified. Residents and businesses can thus control their electricity usage.

The project is a response to the EU energy efficiency Directive that requires suppliers to inform private customers about their current consumption at least once a month. It aims at energy suppliers and their service providers to help them implementing electronic remote meter reading. The new e-service increases the quality of the consumption data recorded and enables suppliers to save time and costs because they have to follow up on a significantly lower number of bills, and customers have less reason to complain. Metre infrastructure and energy data management on the suppliers' side (e.g. processing data for billing, demand forecasting) is provided by local partners of Deutsche Telekom.

E-learning: shared educational platform for schools – In 2008, Deutsche Telekom and Friedrichshafen also launched the use of the Internet-based education platform Edunex (Education Next Generation) for T-City. Educational institutions ranging from high schools to vocational schools were equipped. The Edunex modular learning platform can be integrated into classroom teaching differentiated by school levels and teaching methods. By its multimedia enabled environment, pupils are enabled to learn individually, in groups and partner works as well as project-orientated. Confident and easy handling of computers and the internet is the main educational objective. Subject modules include content from libraries and school book publishers, information from the internet as well as training materials that teachers have generated themselves. The platform is extend to a social network offering e-mail, chat rooms, forums, virtual classrooms, blogs and wikis. Edunex is

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[172] Deutsche Telekom (2013) 'Deutsche Telekom launches new electromobility and healthcare projects', December, http://www.telekom.com/media/company/101990.

currently already being used by roughly 130.000 students and 12.000 teachers at 700 schools in Germany[173].

E-learning: The 'Kindergarten online' portal was developed in the T-City and later became a widely used product available for all local governments in Germany. The tool facilitates the organisation of Kindergartens and the planning of requirements. It helps communities to meet regulations concerning the provisioning of public daycare facilities. Parents can register their children online and local governments can allocate ressources accordingly. Planning authorities profit from the greater transparency created between administration and kindergartens.

E-Customs: The German website 'zoll.de' provides information to individuals and businesses on matters related to customs. It also provides access to the electronic portal EMCS that can be used for electronic customs declarations.

E-Tax: The German e-tax system 'Elster' can be used for electronic tax declarations such as Income tax registration and VAT return on the federal level and in all sixteen states. Elster is a software program that can be used (in combination with accounting software) for tax declarations. It consists of three components: a client component that can be integrated into any tax or financial accounting software, server software that is located on two clearing houses in Munich and Dusseldorf, and software systems that are used in the control centers of the 16 states.

3.6. Mapping and analysis of ubiquitous developments in EU Member States

Table 12 provides an overview of services developed within the EU Member States included in this study. The mapping again takes place according to the areas in which services were identified: infrastructure, e-procurement, e-learning, e-identity, e-health, e-customs, e-tax, citizens' and business portals, and smart city developments. As was the case with the non-EU jurisdictions' mapping, this list is by no means exhaustive, but it provides an overview of the main services that have been developed. Table 13 compares the developments in the Member States.

Table 12:   Mapping of services in EU Member States

Ubiquitous developments	Estonia	UK	The Netherlands	Germany
Infrastructure (focus)	X-Road	G-Cloud	Rijkscloud	Infrastructure
e-Procurement	X-Road	NePP	DigiPoort/DigiInkoop	e-Procurement
e-Learning	e-School	Local initiatives	SurfNet, Local initiatives	e-Learning
e-Identity	e-ID Card	n.a.	DigiD	e-Identity

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[173] Deutsche Telekom (2008) 'Schüler in T-City lernen online, Startschuss für interaktive Lernplattform Edunex in Friedrichshafen', 7 March, Bonn.

Ubiquitous developments	Estonia	UK	The Netherlands	Germany
e-Health	e-prescription, Electronic Health Record	ICT in the National Health Services	Home Care SenseNet; Electronic patient record	e-Health
e-Customs	e-Tax / e-Customs	n.a.	AGS e-Customs	e-Customs
e-Tax	e-Tax / e-Customs	e-Taxation	Prefilled tax forms	e-Tax
Citizens' portal	State e-Services Portal	DirectGov	MijnOverheid.nl	Citizens' portal
Business' portal	e-Business Register	BusinessLink	Antwoord voor Bedrijven	Business' portal
Smart cities	Smart City Lab	Smart cities pilot program	Convenant Smarter Cities, several local initiatives	Smart cities
Smart cities	Smart City Lab	Smart cities pilot program	Convenant Smarter Cities, several local initiatives	Smart cities

Table 13:   Comparison of developments in EU Member States

Ubiquitous developments	Estonia	UK	The Netherlands	Germany
Definition of ubiquitous	Greenfield infrastructure driven approach (X-road).	Strong emphasis on elimination of access barriers and regional or demographic disparities	Focus on interoperability and the setup of registries.	Most e-services are intended to be accessible via different devices.
Approach (implementa-tion)	Preference to re-use of existing building blocks and technologies, rather than to invent 'new' ones	Major efforts (partially successful) to address e.g. procurement and partnership problems	Development and implementation of key building blocks enabling of u-government policies (ie. broadband, IoT, RFID, senor networks, cloud)	Coordination of acitivities on federal, state and local level, through the set-up of registries and portals

Ubiquitous developments	Estonia	UK	The Netherlands	Germany
Policy focus	Coherent, stable and secure platform for e-services. Many services fall into this category. These include Estonia's e-Estonia initiative, x-road, e-identity and e-taxation programmes	History of 'national strategies' (e.g. transformational government, joined-up government, etc.)	In the past a strong focus on administrative burden reduction, currently on interoperability and standardisation	Secure infrastructure for e-services on multiple channels, using existing infrastructure; adjusting the legal frameworks
Policy aim	From the 1990s the Estonian government supported the idea of a modernised public administration system based on ICT solutions.	Active development and extension of Universal Service principles	Instead of a top down implementation of perceived 'grand' technologies, the Dutch government and industry seem to experiment and encourage competition	Major goal is to modernise public administration for the benefit of government agencies, businesses and citizens
Parties involved	Centralised organisational structure, in which decisions for e-Government solutions are coordinated top-down and carried out by all relevant government organisations	Carefully articulated governance structures including Office of Government Commerce (to govern procurement), Cabinet Office, etc.	Responsibility for u-government policies is shared across several ministries (e.g. Ministry of Economic Affairs, Ministry of Internal Affairs, Ministry of Infrastructure and Environment)	IT-Planning Council, Federal, State, and local government agencies (esp. in the field of 'interior' and 'economy'), private businesses (ICT industry and e-services providers)

Ubiquitous developments	Estonia	UK	The Netherlands	Germany
Investments by parties	Strong private sector engagement in the development of public services	Limited integration of ICT and non-ICT stakeholders and shift in objectives (from improving the coherence and effectiveness of government ICT to minimising ICT costs)	Rather than a top-down approach implementing 'grand' technologies, the Dutch government and industry seem to experiment and encourage competition (no winner takes all approach)	Mainly tax funded, but PPP projects are different (shared funding by involved business and administration)
Techno-logical focus	ICTs are seen as a driver of change and have offered opportunities and are allowed to break down old structures starting with low level of technical and organisational legacies	G-cloud initiative designed to provide common ubiquitous computing infrastructure within government and beyond	Incremental and experimental approach in the development of technological solutions and applications	Fostering standardisation and uniform application programming interfaces, establish access to e-services from all plattforms via existing infrastructures
Current state	An early adopter of ICTs and considered one of the leading e-societies in the world	One of the earliest, most sophisticated and best-integrated sets of e-government initiatives, backed by a federal policy stance	The Netherlands is among world's e-Government development leaders (it currently ranks second, only after South Korea)	Successful implementation of several solutions completed, emphasis more and more on coordinations between different government levels (federal, state, local)

Ubiquitous developments	Estonia	UK	The Netherlands	Germany
Perceived impacts	Estonia is known for its successful and innovative use of ICTs and has produced and uses many innovative public sector services (e.g. i-Voting, e-Cabinet and e-Health systems) that can serve as best practices	A series of reforms relating to procurement have been extended to provide ubiquitous tools to support e-procurement within and beyond government	Administrative burden reduction, easier access to services, interoperability between government services and IT	More cost-effectiveness within public administration; savings for businesses by connecting their ICT solutions to e-government solutions; more secure communication
Perceived drivers and barriers	High acceptance of a new e-society in population and supported by supporting data protection regulations	Often limited by slow start, lack of buy-in from key stakeholders and/or shifts in policy/political priorities	Different developments are encouraged to grow, which may lead to conflicting or not interoperable services	Implementation and usage of new e-services sometimes delayed b/c of slow-going amendment of legal framework

3.7. Comparison of leading EU Member States to leading non-European countries

For many different reasons, comparisons need to be addressed with caution.

- We have evaluated a number of countries, inside and outside of Europe, that are acknowledged leaders in regard to ubiquitous applications. This enables us to compare Europe's best to the best anywhere, but does not enable for instance a comparison of Europe's average to a global average.

- Some of the countries that we studied excel at fixed and/or wireless *access* to ubiquitous application solutions; others excel at the applications themselves.

- It is important to distinguish between the ubiquity of a solution within a country and any issues of cross-border interoperability of e-government solutions. Not a single one of the non-EU e-government systems that we studied needed to address issues of international interoperability.

Comparing like for like, and acknowledging the complexities and challenges of making such a comparison, it is by no means a foregone conclusion that the implementation of ubiquitous applications (as distinct from access) in individual front-runner EU Member States such as Estonia and the Netherlands is in any way inferior to that of Europe's most advanced front-runner global competitors such as Japan and South Korea. Our sense is that the best e-government applications among individual European Member States are broadly speaking on a par with the best comparable applications anywhere. Furthermore, 11 out of the top 20 countries in the 2012 UN e-government index are are EU Member States, and

another 15 are mentioned as emerging leaders[174]. This means that very few EU Member States cannot be considered frontrunners or emerging leaders.

Some of the non-EU countries studied have advantages in terms of widespread high speed access, notably by FTTP (fixed) and LTE (mobile). This is a serious issue for Europe, and we address it in Chapter 5, but it is a distinct issue from that of ubiquity of applications (especially e-government applications, which for the most part require only moderate bandwidth).

When it comes to cross-border interoperability of e-government solutions or coordination of development of such solutions, Europe continues to face enormous challenges. Cross-border operations are limited or non-existent. These challenges are largely unique to Europe, which is effectively a confederation of 28 Member States. As a result of this situation, many services that are ubiquitous on the level of a particular Member State, are not accessible on the level of the EU, contributing to fragmentation of the Digital Single Market These challenges represent the major focus of Chapters 6 through 8 of this report.

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[174] UN, 2012.

4. UBIQUITOUS GLOBAL SERVICES

KEY FINDINGS

- Ubiquitous global services include a wide range of services and platforms, including eCustoms services developed by SAP, the eBay market place, Microsoft's cloud services and Skype VoIP service, the Facebook Platform and Facebook Connect, a range of offerings from Google, and the Apple App store. xx.

- The ubiquitous market solutions have been, with the exception of Skype and SAP, developed in the US. Skype, which represents a noteworthy example of a European contribution to ubiquitous services, is now owned by Microsoft. At the same time, many of these US-owned enterprises contribute to the European economy in various ways, including the maintenance of European research centres.

- The ubiquitous market solutions mostly look at EU-level coordination for overcoming barriers they perceive rather than for coordination of services development. For the eCustoms systems SAP is developing, for example, overcoming fragmentation of implementation of regulation is important. Skype and eBay are looking at the protection of net neutrality to overcome the risk of their services being hampered.

Besides looking at ubiquitous developments in non-EU jurisdictions, this study also looks into several ubiquitous global market solutions. They cover a wide range of services and platforms and this list is by no means exhaustive. We included a number of different ubiquitous platform developments such as services including eCustoms developed by SAP, the eBay market place, Microsoft's cloud services and Skype VoIP service, the Facebook Platform and Facebook Connect, a range of offerings from Google, and the Apple app store.

4.1. SAP

SAP is a German company, operating globally, selling enterprise applications to clients in 188 companies[175]. The company develops systems such enterprise resource planning systems and cloud computing platforms. It integrates sensor technology and mobile applications into these systems to allow for input and access from anywhere at any time.

In the field of cross-border governmental solutions, SAP develops supply chain management platforms, including sensor technology – for example for tracing products. Areas in which SAP is developing these services include food safety and eCustoms, using barcodes, QR codes and/or RFID technology. One application of such technology in the field of eCustoms is tracing goods, such as pharmaceuticals, which are the most widely counterfeited products within the EU. Such solutions allow, for example, pharmaceutical companies to easily declare which products they export to certain markets, as different laws and regulations exist across different jurisdictions. Typically, pharmaceuticals are checked against databases of products that are allowed in a specific jurisdiction by importing or exporting companies. SAP supports this process for companies in different markets. This could be elaborated by checking transports to identify products that are not declared by these companies, thereby supporting the tracing of counterfeited goods.

Similarly, in the area of interception of counterfeited pharmaceuticals by Customs agencies, SAP provides solutions to allow tracing specific products, for example by setting up a

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[175] SAP, http://www.sap.com/corporate-en/our-company/index.epx.

centralised database with all valid codes. Border agencies could then match the goods they find with the codes in these centralised databases. Goods that do not have a valid unique identifier can be assumed to have been counterfeited and can thus be intercepted.

4.2. eBay

eBay is a world-wide operating online market place, having over a hundred million registred customers[176]. eBay functions as a platform for over 350.000 (often small) webshops who want to sell their products online, and bought the trusted payment mechanism, PayPal, after its own payment mechanism BillPoint was being used less than its competitor. For (smaller) webshops, using eBay is often cheaper than selling their products through their own website because lower transaction costs are incurred. The company recently bought GSI Commerce, which allows the setup of a platform for retailers that allows for services such as customisation of products. Setting up a trusted platform thus appears to be one way of creating a ubiquitous market.

Although the overall Digital Agenda for Europe (DAE) objectives for eCommerce are nearly met inasmuch as nearly 40% of European consumers buy products or services online compared to a target of 50%, the DAE objectives for cross-border eCommerce are not yet met (instead of 20% of consumers buying online across borders, only 10% of consumers did so in 2011). An eBay report on international trade flows, however, shows that 94% (via the eBay platform) of the smallest 10% of commercial sellers export, and that 81% of those exporters sell to five or more foreign countries[177]. Moreover, newcomers on online platforms grow faster than their offline counterparts.

4.3. Microsoft

Microsoft is the world-wide operating software company that develops cloud services such as 'SharePoint', 'Skydrive' and 'Azure', and owns the Skype *Voice over IP (VoIP)* service. In order to increase its efforts and capabilities in the cloud computing domain, Microsoft has invested heavily into server and IT infrastructure[178]. Apart from US locations, Microsoft has established data centres in a number of countries including Ireland, the Netherlands, Singapore, HongKong and Brazil[179].

Regarding the development of cloud services, providing an infrastructure for new web entrepreneurs to emerge is especially important in Microsofts' view, since this will allow for the development of new services and new businesses for the Digital Single Market. Since they will be using the internet, access to broadband may turn out to become the weakest link for these developments. Supporting the emergence of these web entrepreneurs will thus be especially important from an economic point of view and a level playing field could be created by removing inconsistencies between different rules or legislations between Member States and by creating global standards, such as ISO standards on the handling of information meeting data protection requirements.

4.4. Skype

Skype provides worldwide (voice and video based) IP to IP communications. It also enables users to place calls to conventional telephone numbers. Skype also provides an inexpensive alternative to traditional videoconferencing systems. Videoconferencing systems are often

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[176] eBay, http://pages.ebay.nl/aboutebay/thecompany/companyoverview.html.

[177] eBay (2012) 'Enabling Traders to Enter and Grow on the Global Stage', http://www.ebaymainstreet.com/sites/default/files/eBay_Enabling-Traders-to-Enter-and-Grow-on-the-Global-Stage.pdf.

[178] Chou, D. (2009) 'Microsoft Cloud Computing, http://de.slideshare.net/davidcchou/microsoft-cloud-computing.

[179] Windows Azure: Privacy, http://www.windowsazure.com/en-us/support/trust-center/privacy/.

very expensive, while Skype VoIP can be accessed via personal computers. Skype is anxious to ensure that its services can be provided also over mobile and handheld devices. In some countries, the use of Skype VoIP services in handsets is hindered when mobile network operators restrict the use of VoIP applications. Skype also maintains that performance restrictions on its VoIP services can harm the quality of service and thereby hamper individuals and organisations from using Skype. Consequently, Skype is advocating net neutrality in order to be protected by law, as is happening in the Netherlands and Slovenia.

Skype was founded in Estonia, and continues to have major operations in Estonia and Luxembourg. It thus represents a prime example of a ubiquitous service that originated in Europe; however, control of the company no longer resides in Europe. The company has been through a series of acquisitions starting in 2005. In October 2011, Microsoft Corp. finalised its acquisition of Skype Communications S.a.r.l.[180].

4.5. Facebook

Facebook is prominent among social media as a ubiquitous platform connecting billions of persons. It has the objective of connecting persons and organisations with specific digital identities and allows to connect to numerous third party Internet services. Besides many commercial organisations, also many governments maintain a Facebook presence. Facebook (together with other social media) can provide a simple and direct connection with customers and citizens. By providing simple and direct interaction, Facebook and other social media can enable and empower customers, citizens and residents, in their dealings with governments, in their commercial dealings and in their interactions with one another. Particularly relevant to this discussion is the Facebook Platform, a series of Application Program Interfaces (APIs) which enable third party developers to create applications for the Facebook environment. Key components include:

- *Graph API*: enables third party applications to navigate the data entities stored in Facebook (such as people, photos, events, and pages) and the relationships among them.

- *Social Plug-ins*: make it easy for developers to use the Like button, Recommendations, and the Activity Feed in other web applications.

- *Facebook Connect*: a set of APIs that makes it easy for application developers to enable users to log on to their third party non-Facebook applications using the user's Facebook userid and password. This facilitates interaction of third party applications with Facebook data and with Facebook friends[181].

Facebook's CEO has recently initiated 'internet.org', which aims to bring internet to the two-thirds of the world population that currently does not have access[182].

4.6. Google

Google is a leader in modern applications based on notions of cloud services and ubiquity. Its applications are the epitome of cloud-based ubiquity. Its webmail service 'Gmail', for instance, can (like any webmail service) be invoked from any device that has web access, with no dependency on prior installation of specialised software. As is its cloud service 'Google Drive'.

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[180] Founded in 2003, Skype was acquired by eBay in September 2005, and then acquired by an investment group led by Silver Lake in November 2009. See e.g. http://www.microsoft.com/en-us/news/press/2011/oct11/10-13SkypePR.aspx.

[181] New York Times (2008) 'Facebook Aims to Extend Its Reach Across the Web', 1 December.

[182] Internet.org, www.internet.org.

Google is an extremely successful firm with a global marketplace. Their global focus is evidenced by their emphasis on translation tools, and also by localisation of their applications (ability to interact with software tools in multiple languages). It is even visible in the 'Google Doodles' that grace Google's standard search page, many of which reflect national heroes, events or holidays. Within these bounds, however, they appear to attempt to meet global computing and communication needs with common and standardised solutions.

Besides being a commercial platform providing many different commercial services, Google has a 'Google Apps for Government' programme for the US and Canada. This programme has a focus on the use of tools such as 'Google Maps' and 'Google Apps' by government. They tout examples where Google Maps are use by first responders (Public Protection and Disaster Relief), or where Google apps (calendar, spreadsheets and documents) are used to foster collaboration among multiple municipal departments. They highlight the many advantages of distributed, cloud-based solutions for government agencies. Among these advantages are reduced infrastructure requirements (since much of the computation takes place on Google servers); simplified and highly automated software maintenance; and enhanced collaboration.

4.7. Apple

Apple was an important driver of ubiquity into consumer markets. The Apple 'App store', launched in 2008 and marked the 50 billionth download in May 2013. It offers 850.000 apps to iPhone, iPad and iPod touch users in 155 countries around the world, with more than 350.000 native iPad apps[183]. Overall, the store has 575 million registered accounts. Applications are offered as one-off (often paid) downloads, and the store also supports supplementary (In-App) purchases and (since 2011) subscriptions (where users subscribe to the app to automatically receive updates and additional content in exchange for a subscription fee. This allows Apple to share revenues with app developers[184].

While the service is theoretically accessible by anyone and anywhere – making the app store potentially ubiquitous, in reality users are segmented along multiple dimensions. Firstly, applications are preferentially provided to users of Apple devices[185]. Using an app store can create lock-in due to the limited availability of equivalent apps across stores and dependence on updates to apps. For this reason, the French competition authority has launched investigations into the lock-in effects and consumers inability to switch once they purchase apps from forums like Apple's 'App Store', Amazon's 'Appstore' or 'Google Play'[186].

Secondly, app stores are geographically fragmented along country lines in order for the company to comply with government restrictions, licensing or copyright laws. This setup makes it impossible for users to create accounts or purchase apps from a country that they

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[183] Apple (2013) 'Apple's App Store Marks Historic 50 Billionth Download', 16 May, http://www.apple.com/pr/library/2013/05/16Apples-App-Store-Marks-Historic-50-Billionth-Download.html.

[184] Typically, Apple takes 30% of revenues for downloads, In-App purchases and subscriptions, which have led some small developers to complain that they are being 'locked out' – see e.g. http://www.intomobile.com/2011/02/16/rhapsody-apple-app-store/.

[185] More precisely, the App Store per se provides access to applications developed with (and often for) Apple's proprietary iOS operating system. Applications can be downloaded directly onto iOS devices, or indirectly (via Apple's iTunes platform) onto MAC and PC computers. Some of the apps will run on other devices, but most are restricted. Other platforms (e.g. Palm, Android, Windows, Nokia (S40 and S60), Samsung (Bada), RIM (Blackberry), and gaming devices (e.g. Nintendo (DSI and 3DS), Sony Playstation) have similar facilities, but all distribute applications targeted at specific devices and/or operating systems and are thus not 'technically ubiquitous'.

[186] Gigacom (2013) 'France probes app stores over "lock-in," confirms raid on Apple', 1 July, http://gigaom.com/2013/07/01/france-probes-app-stores-over-lock-in-confirms-raid-on-apple/.

are not physically located in or have their credit card registered in. Discrepancy between location and account nationality if detected by the system may lead to inability to access the service at all[187].

Other Apple ecosystems, such as the 'iCloud' launched in 2011, adhere even more closely to ubiquity of access (albeit not in terms of interoperability). The iCloud service seamlessly and wirelessly synchronises information used by Apple applications (e.g., calendar, contacts, photos, 'iWork') across Apple devices[188]. It offers 5GB of cloud-based storage in addition to free storage of all content purchased via the Apple stores. iCloud integration happens at the application level and the service controls how much of the data synchronisation is presented to the user.

Despite being free of charge and aiming for seamless integration between user devices and cloud storage, the iCloud can only be accessed with an Apple ID and does not offer file sharing with others. While these features limit users' incentives to look to other brands for successive purchases of multimedia devices, they also limit the level of ubiquity by not allowing users to reap the benefits of syncing between web apps and non-Apple devices[189].

4.8. Comparison of ubiquitous global services

This section maps the ubiquitous market solutions according to the sector in which they have been developed in Table 14 and compares the ubiquitous market solutions in Table 15.

Table 14:   Mapping of ubiquitous global services

Ubiquitous market solution	SAP	Microsoft	Facebook	Google	eBay	Apple
Infrastructure	Supply chain manage-ment	Cloud services; VoIP	Social network	Search Engine	e-Com-merce platform	App Store; iCloud
e-Government services	Platform develop-ment for eCustoms (and e.g. food safety)		Facebook Connect e-Identity	Google Apps Google Maps Google Play		
Social media and commercial services		Support of web entrepre-neurs		Provisioning of museum tours, books and films		

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[187] iTunes Terms and Conditions, http://www.apple.com/legal/internet-services/itunes/us/terms.html#GIFTS.

[188] iCloud, http://www.apple.com/icloud/.

[189] Waters, J. (2011) 'Apple races to keep users firmly wrapped in its cloud', FT 11 June; Marshall, C. & Tang, J.C. (2012) 'That syncing feeling: Early user experiences with the cloud', Proceedings of the Designing Interactive Systems Conference, ACM.

Table 15:   Comparison of the ubiquitous global services

Ubiquitous market solutions	SAP	Microsoft	Facebook	Google	eBay	Apple
Definition of ubiquitous	Traceability of products	Accessible through the internet	Universal access to services	Accessible through the internet	Lowering transaction costs for smaller companies selling online	Internet acces-sibility, cloud storage (also for hosted apps)
Approach (implemen-tation)	Information exchange platform, integrating sensor technology	Services that are accessible through the internet	Access to services using the same login details	Services that are accessible through the internet	e-Commerce platform	e-commerce platform, cloud storage
Technological focus	Databases, networks and sensor technology	VoIP	Web-service	Web-services	Web-services	iOS apps, cloud storage and content pro-vision

Ubiquitous market solutions	SAP	Microsoft	Facebook	Google	eBay	Apple
Current state	In certain areas product tracking solutions have been implemented	Service is accessible via personal computers, but throttled by some mobile operators in certain countries	Different services use the Facebook login service	Google app store	Online market place, secure payment system	Apple app store, iTunes, iCloud (included hosted accounts and subscrip-tions)
Perceived impacts	Easy tracing of counter-feited goods, such as pharma-ceuticals	Lowering transaction costs for communica-tions	Easier access to different web-services		Lowering transactio n costs for (small) webshops	Lowered access costs to captive audiences (up- and down-stream), lack of neu-trality, vertical market fore-closure
Perceived drivers and barriers	Fragmen-tation of implemen-tation of regulation across Member States	Hindrance of IP traffic used for VoIP by mobile operators in certain countries		Services not accessib le via the internet	Fragmen-tation of legislation across Member States, e.g. consumer law	App eco-system develop-ment, ubiquity of smart devices, reduced DRM cost; technologic al spe-cificity, lock-in/out.

Many of the commercial services did not identify major areas where they perceive a need for new public policy interventions. They did not identify specific needs in terms of research policy or standardisation. We presume that they would benefit (as would most firms in this space) from increased consistency of policy in regard to content and telecommunications regulation, for example in regard to jurisdiction, permissible content, and privacy.

The ubiquitous market solutions mostly look at EU-level coordination for overcoming barriers they perceive rather than for coordination of services development. For the eCustoms systems SAP is developing, for example, overcoming fragmentation of implementation of regulation is important. Skype and eBay are looking at the protection of net neutrality to overcome the risk of their services being hampered.

5. ACCESS TO UBIQUITOUS SERVICES VIA FIXED AND MOBILE BROADBAND

KEY FINDINGS

- Several countries outside of Europe have substantially greater deployment and adoption of FTTH (fixed) and/or LTE (mobile) high bandwidth services than does any EU Member State.

- The limited availability of FTTH (mitigated by availability of cable in some Member States) presumably limits the commercial solutions that can be deployed, but probably has only limited adverse impact on ubiquitous e-government applications, which tend to require only moderate bandwidth.

- The relative lack of high speed LTE mobile broadband deployment in Europe, however, clearly limits the ability to access these services from anywhere, and at any time.

The network operators that offer fixed and mobile broadband connectivity (together with public or municipal providers) collectively offer a service that represents a key enabler for the ubiquitous services that are central to this study.

European policy as regards promotion of broadband are embodied in the 'Europe 2020' strategy, and its flagship initiative the Digital Agenda for Europe (DAE). The DAE seeks:

- by 2013, to bring basic broadband to all Europeans;

- by 2020, to ensure that all Europeans have access to much higher Internet speeds of above 30 Mbps; and

- by 2020, to ensure that 50% or more of European households subscribe to Internet connections above 100 Mbps.

Although these goals seem clear, there is great uncertainty as to what each of them means. However defined, there are also significant challenges in achieving these goals. Even the first goal (100% coverage of basic broadband in 2013) is now understood to be unlikely to be fully achieved, largely because of gaps in the coverage of fixed telecommunications networks in some rural areas and in some of the newer Member States.[190] Cable presumably fulfills the 30 Mbps and 100 Mbps goals, but cable does not cover the full EU, and the cable coverage footprint is not expected to grow much in the coming years. Deployment of fibre-based VDSL and FTTP solutions is unlikely to achieve full coverage of the EU by 2020 because consumer *Willingness-to-Pay* appears to be insufficient to fund full deployment.

Mobile data connectivity, however, appears to be more promising. The rapid increase in the use of mobile data is driving a somewhat faster-than expected coverage of mobile services based on LTE (Long Term Evolution) technology. The coverage of LTE or LTE Advanced wireless in Europe can be expected to be at least as great as that of 2G and 3G wireless today[191]. This seems to imply that most remote, low density, or hard to reach locations can be served using LTE or LTE Advanced.

Newly emerging data suggest that these fixed and mobile tendencies are more interdependent on one another than they used to be. The majority of data produced by

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[190] Point Topic (2012) 'Broadband coverage in Europe in 2011: Mapping progress towards the coverage objectives of the Digital Agenda', Study for the European Commission.

[191] Yardley, M. et al. (2012) 'Policy orientations to reach the European Digital Agenda targets', Analysys Mason, 23 May.

ostensibly mobile devices appears in practice to be off-loaded to private Wi-Fi at home and at work, while public Wi-Fi and femtocell, a small cell that connects cell phones to broadband networks in a home or office setting, solutions seem to have promise[192].

The relative lack of high speed mobile broadband with LTE clearly limits ubiquitous access anywhere, and at any time. For nomadic use in the city, Wi-Fi may be a perfectly adequate substitute; however, for truly mobile use, or for use where hot-spots are not widely available, the relative lack of LTE deployment in Europe can be viewed as a limitation on ubiquitous access.

How serious a problem is it that European deployment of FTTP is less than that of Japan or South Korea? Different views are possible. Many worry that Europe is about to irrevocably lose first mover advantage to countries that are further along with the deployment of ultra-fast broadband. A few of us hold the contrarian view that faster broadband will deploy with little or no public policy intervention once demand is sufficient, and note that bandwidth consumption in a front-runner country like Japan appears in fact to be *lower* than in the UK, Germany, or France, suggesting that first mover advantages cannot be great[193].

Relative to linear video, the lack of ultra-fast broadband in Europe may or may not be a serious concern, then, depending on which school of thought one subscribes to. However, in anticipation of 3D immersive media and digital hologram contents, South Korean government adopted broadband targets for 2020 reaching 10 Gbps for the fixed network and 1 Gbps for the mobile network, coupled with substantial investment in improving computational power[194].

Relative to ubiquitous e-government services, the relative lack of FTTP in Europe is probably of limited significance, not only because cable provides high speed access to many Europeans, but also because e-government applications generally require only moderate bandwidth and thus can be served adequately with basic broadband.

In understanding the potential gaps, statistics on the number of broadband subscriptions in a Member State are of limited relevance. Much more important is to know the number of households that could, or could not, potentially reach a ubiquitous service. This is best understood by means of survey data with substantial sample size, such as that provided by Eurobarometer household survey. What these data tell us is that 68% of European households have a personal computer, that 64% of European households have internet access, and that 56% of European households have broadband internet access[195].

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[192] Marcus, J.S. & Burns, J. (2013) 'Impact of traffic off-loading and related technological trends on the demand for wireless broadband spectrum', Study for the European Commission.

[193] Marcus, J.S. & Elixmann, D. (2013) 'Build it! ... but what if they don't come?'

[194] NewsWorld (2012) 'Government Comes Up with 'Giga-Korea Project'', http://newsworld.co.kr/detail.htm?no=436, 12 September.

[195] Eurobarometer (2012), 'e-Communications Household Survey', Special Eurobarometer 381, June.

Figure 2:   Means of accessing the Internet (base: all EU respondents)
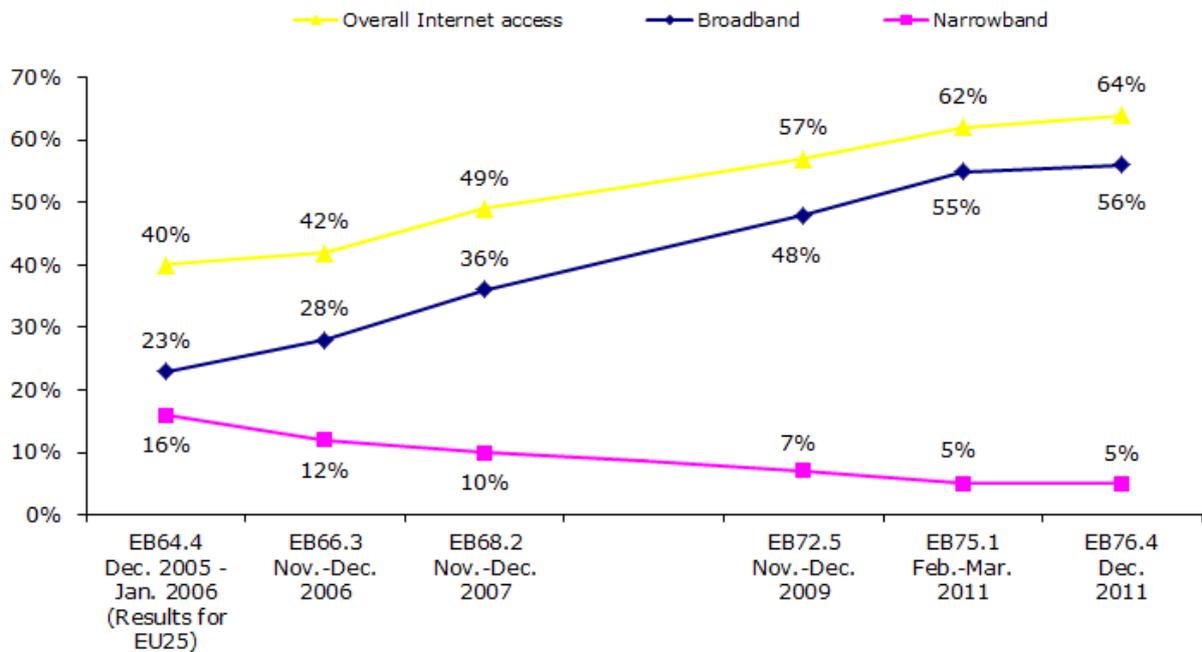
Source: Eurobarometer (2012).

Eurobarometer survey data also tell us that 35% of Europeans can access the Internet from their mobile phones[196] .

The households limited to narrowband Internet access are relatively high in Latvia, Poland, and Romania, as one might expect, but somewhat surprisingly are highest in Germany (13%) and significant in Austria (7%).

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[196] Eurobarometer, 2012, p. 57.

6. AN OPPORTUNITY FOR COORDINATED POLICY AT EUROPEAN LEVEL?

KEY FINDINGS

- Impressive examples such as that of Estonia make clear that there is no fundamental impediment to achieving valuable results within Europe; at the same time, the clear fact that services are not available to citizens in every European Member State and across these Member States begs the question: *Why not?*

- European citizens and businesses have been found by previous studies to value and demand European e-services, in particular in the areas of secure email access, identification and services to jobseekers from the citizens' side and e-signatures, cross-border procurement and sales – related services from the business side. The main areas for improvement suggested were personalised services (business and citizens) and increased transparency of use of personal data (citizens).

- Some of the policy issues raised by the emergence of ubiquitous services are new, but others have been recognised for many years. Since e-government services are mainly implemented to execute regulation within a specific jurisdiction, they have been developed locally or on Member State level. This has led to fragmentation within the Internal Market, as e-government services are by nature different from commercial services. Notably, the need for cross border interoperability and software re-use among e-government services is characterised by significant limitations and has been a long-standing concern at European level.

- The effectiveness of many European e-government services appears to be adversely impacted (1) by lack of public awareness and understanding of them, coupled with overlap between European and Member State programmes (and sometimes even between programmes within a Member State); and (2) by delays in implementation.

- There does not appear to be a substantial shortage of programmes or action lines at European level. For nearly every need that we have identified, some action line already exists, albeit mostly in the realm of soft law and non-binding obligations or fragmented implementation across the EU. Our concern is thus not with a lack of programmatic response; rather, it is that the action lines in place individually and collectively do not appear to be having much effect on the problem.

- The actions of the European Commission are very often in the realm of soft law and pilot projects, and only a handful of actions are translated into legislative proposals or the setting up of cooperation and monitoring frameworks so far. Some notable exceptions are the e-ID and ODR frameworks, as well as the e-VAT and e-customs initiative, that while having a large potential contribution to the realisation of the Single Market and the reduction of economic losses due to the illegal economy, have not managed to fully respect the planned timeframes for realising ubiquitous services. While these services have the potential to enable developments of a Digital Single Market, they also underpin each other, making possible synergies that are not always fully drawn out in policy documents.

- Europe brings substantial strengths to the deployment of these technologies in commercial and e-government settings, but also some weaknesses. Taken as a whole, they represent a significant opportunity not only to reduce costs, but also to increase government transparency and citizen empowerment.

- A so-called *SWOT* analysis is a useful tool for gaining a balanced understanding of Europe's *S*trengths and *W*eaknesses, and the *O*pportunities and *T*hreats to which Europe is subject.

- At European level, key objectives for a European intervention might include: ensuring that existing policy instruments are effective; 'joining up' e-government implementations so as to achieve realistically realisable economies of scope and scale; facilitation of data interchange among e-government applications so as to enable cross border interchange of information where appropriate (and with due respect to individual privacy); and coordinating research and standardisation policy so as to avoid needless duplication and waste.

- The principles of subsidiarity and proportionality always play a key role in European policymaking, but subsidiarity is especially salient in this case. In general, e-government cannot enjoy a greater degree of commonality across Member States than the underlying government activities that it implements. This implies that for most applications, a 'one size fits all' solution is unlikely to be appropriate; however, there is still considerable scope for action at European level. European initiatives to enhance the cross border interoperability of e-government services, or to improve their efficiency or to encourage the use of more modern and user-friendly technology, offer obvious benefits and are not *per se* incompatible with the principle of subisidiarity.

- Beyond barriers to uptake and deployment of ubiquitous services, the threat of privacy and security breaches represents an ongoing concern.

The examples presented in Chapters 2 and 3 provide a clear picture of what can be achieved today, and what is already being achieved in some countries and regions, through the use of these new services for e-government and for commercial services.

They also make clear that successes in some countries are not replicated in others. The impressive example of Estonia makes clear that there is no fundamental impediment to achieving results like these within Europe; at the same time, the clear fact that not every European Member State implements services at the same level or to the same degree as Estonia inevitably begs the question: *Why not?* Why are the successes and lessons learned in one Member State not replicated in other similar Member States? Is there some failure to 'join up' activities across the Member States, or from the rest of the world to Europe?

Our Terms of Reference did not specifically call on us to provide an Impact Assessment; however, they did call on us to assess costs and benefits of an ostensible lack of coordination at European level, in comparison with a more activist policy at European. We found it methodologically convenient to produce an Impact Assessment in abbreviated, 'skeleton' form as a means of assessing the relative costs and benefits of potential policy interventions in comparison with an extrapolation of current policies (or lack of them) in a 'business as usual' scenario. This chapter sets the stage for that analysis.

In the sections that follow, we provide (1) a brief summary of actual and potential coordination policies and mechanisms at European level; (2) an analysis of European strengths and weaknesses in regard to the potential opportunities that the 'digital single market' technologies open up; (3) an assessment of the challenge for Europe, which effectively represents a problem statement; (4) a discussion of metrics and indicators by

means of which existing initiatives in Europe and elsewhere could be evaluated; and (5) possible goals and objectives for Europe in regard to these emerging technologies.

6.1.   Coordination at European level

Our terms of reference, in this respect, focus on a range of e-government services, but we have been asked to address commercial services as well in the context of new developments of the Digital Single Market.

6.1.1.   Technology related policies

It has long been recognised that Member States' public administrations could potentially benefit from a common underlying approach to e-government services that would enable efficient, effective e-government services, including cross-border interoperability, and that such services could in turn help citizens and businesses to profit fully from the EU's Single Market. Long-standing European objectives recognised in the on-going Digital Agenda for Europe (DAE) flagship initiative and in the proposed Connecting Europe Facility (CEF) financial instrument[197] entail the creation of a pan-European network for e-government services, and of a layer of middleware and APIs to facilitate interoperability of e-government services among Member States (with due respect to privacy, security, and subsidiarity). Numerous interrelated initiatives such as the 'European Interoperability Strategy' (EIS) and the European network for secure information exchange 'sTESTA' network seek to progress these goals; however, the level of integration and commonality of e-government services in Europe today appears, based on our findings, to still offer a great deal of room for improvement. In particular, the current state of development appears to support a possibility for further development of these services along national or linguistic boders and/or characterised by a high level of duplication of services.

As regards commercial services, it is usually first preference to leave these matters to the marketplace unless there is evidence of market failure. The proposal for the revised Regulation on trans-European networks [COM/2013/0329 final - 2011/0299 (COD)] says: "For the supply side, the limitations relate to a strong degree of sub-optimal market failures situation and the concomitant weak business cases for investment in broadband networks and delivery of essential public interest services (e.g. eHealth, eIdentity, eProcurement and their cross-border interoperability). On the demand side, the Digital Single Market with its considerable growth potential relies on all citizens, businesses and administrations being connected to digital networks."

Market failure in this area arises from:

- The difficulties of monetising public service delivery benefits;

- The high degree of market power in provision of e-enabled public services[198];

- Additional 'natural monopoly' and 'tipping' failures in the provision and operation of broadband infrastructures;

- Long-standing (cultural and administrative) barriers to effective cross-border competition in public service outsourcing;

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[197] Particularly the CEF Digital Services Infrastructures (DSI), which was allocated up to EUR 2 billion of the proposed EUR 9.2 billion budget for ICT infrastructure. This total was cut to EUR 1 billion in February 2013. In a blog post following the budget cut, Commissioner Kroes indicated that "this funding will have to be exclusively for digital services: because such a smaller sum does not leave room for investing in broadband networks" (see http://blogs.ec.europa.eu/neelie-kroes/eu-budget-innovation-cef/). This is likely to be dedicated to e-invoicing and e-procurement; developments depending on ubiquitous high-speed broadband deployment are much less certain.

[198] In most countries, public procurement of strategic ICT services is dominated by a few long-term incumbents.

- Political and macroeconomic risks that are not properly priced or allocated in venture capital markets and/or long-term e-government service provision business models; and

- Informational asymmetries between governments and private service providers; and

- Fragmentation of the Digital Single Market along the borders of national markets, which consequently results in the discrimination of consumers as service providers often refuse to provide cross-border services due to different IPR regimes and other regulatory and market factors[199].

That said, it is of course necessary to encourage active private sector involvement:

- To ensure consistency and interoperability between public and private telecom and service ecosystems;

- To increase the scope and vigour of competition to provide faster, cheaper and better services;

- To deliver the 'external' benefits associated with DAE targets; and

- To ensure that hard-won market efficiencies in the ICT sectors are not undermined by favouritism or hold-up associated with provision of essential public services.

This suggests that policies should:

- Combine support and regulation;

- Be joined-up across public service, social, competition and macroeconomic areas; and

- Be coordinated (if not harmonised) at a European level and should focus on a 'new industrial policy' approach of encouraging effective competition.

Despite the dangers of technological determinism, it is worth noting that a number of instruments exist at European level that can be used to promote specific technological developments, or to 'join up' technological initiatives that might otherwise remain disjointed. Among these historically were the 'Framework Programme' (FP), the 'Competitiveness and Innovation Programme' (CIP), the 'European Interoperability Framework' (EIF), and the option for mandates to the 'European Standardisation Organisations' (ESOs). The first two of these have recently been joined under the 'Horizon 2020' programme[200]. With the elimination of Community-level funding for new high-speed broadband infrastructures, such novel instruments may also be necessary in order to ensure that the underpinning ubiquity of access is realised, such as measures to reduce administrative costs and barriers to deployment and facilitating the participation of other funding sources.

6.1.2.   European citizens value and demand European e-services

As a result of continuing budget pressure in Europe, the political will to pursue innovation in ubiquitous policies such as e-government will likely be affected in the direction of favouring applications with direct empirically demonstrable links to positive socio-economic effects (for instance by offering solutions to challenges posed by population aging, education or

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[199] See e.g European Commision (2011a) 'A coherent framework for building trust in the Digital Single Market for e-commerce and online services', COM(2011) 942 final, and its accompanying working document European Commission (2011c) 'Online services, including e-commerce, in the Single Market', SEC(2011) 1641 final, as well as European Parliament (2013) 'Resolution on completing the Digital Single Market', 2013/2655(RSP).

[200] Horizon 2020, http://ec.europa.eu/research/horizon2020/index_en.cfm.

unemployment) or cost savings. The ubiquitous services proposed span the 'four freedoms' which are fundamental to the 'Single Market' and underlie several other EU policies: the free movement of people, capital, goods and services. The overall goal of these initiatives is increasingly moving towards that of creating value shared by all segments of society, further enabled by the deployment of ubiquitous technologies to ensure multi-platform delivery and accessibility of these integrated services around the clock.

Policy areas of interest

Demand and willingness to pay for cross-border service cooperation by citizens and businesses has been found to follow these broad lines. Based on a survey conducted among citizens and businesses across a representative sample of EU Member States[201], despite differences between Member States in the level of enthusiasm about EU-wide services, citizens would like European government to cooperate for developing joint services in areas related to internal security, anti-terrorism and law enforcement cooperation. Migration and climate change were perceived as the least relevant policy areas for these services. In addition, citizens expressed their preferences for developing joint ubiquitous services in consumer protection and education, while migration and transportation were perceived less as a priority.

Demand for e-government services

Citizens and businesses were also found to value EU-wide e-Government services, facilities and infrastructure. In particular, secure email access for all communication, followed by a European electronic identity card (See Text Box 1), and a European registry of available jobs and job seekers were valued highest by individual respondents. These services correspond to the first of the freedoms mentioned above, as they enable an easier and more secure free movement of workers and citizens across the EU. Some of these interests were further confirmed by public consultations, for instance by the one preceding the adoption of the Commission proposal for regulating e-ID's and trust systems[202]. E-identification systems (along with language barriers) were confirmed by the literature as major barriers and potential enablers towards a digital single market and cross-border services[203]. Businesses also indicated interest in initiatives underlying the freedom of movement of goods, services and investment. Their priorities included e-signatures, as well as cross-border procurement and sales processes enabled by EU-wide ubiquitous services.

Views on data sharing

Although companies expressed an overall support for data sharing to facilitate these functions, citizens remained divided over the issue of cross-border data exchange necessary to realise EU-wide e-government services[204].

In conclusion, the main areas for improvement suggested by the survey (see Table 16) were personalised services (business and citizens), and increased transparency of use of personal data (citizens). Services such as e-ID's and trust provisioning are considered enablers of (ubiquitous) e-government services.

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[201] RAND Europe (2010a) 'eGovernment scenarios for 2020 and the preparation of the 2015 Action Plan', TREND ANALYSIS (D3) SMART n° 2009/0069, Study for the European Commission.

[202] Highlights from the public consultation in Servida, A. (2012) 'EU policies and initiatives on electronic identification and trust services', http://meetings.abanet.org/webupload/commupload/CL320041/relatedresourc es/09-AS-EU-Policies-ABAMeeting-Dec2012.pdf.

[203] Economisti Associati (2012) 'Roadmap to the Digital Single Market: Prioritising Necessary Legislative Responses to Opportunities and Barriers to e-Commerce', Note for the European Parliament, IP/A/IMCO/NT/2012-13.

[204] RAND Europe (2010b) 'Preferences of citizens and businesses for pan-European services'.

Table 16: **Pan-European service preferences, order of preference by businesses and consumers**

Pan-European service preferences	Businesses	Citizens
Secure email channel for all formal communication	2	1
EU standard for digital signatures	1	3
EU electronic identity card	3	2
EU wide electronic platform for public procurement	4	n.a.
EU registry of available jobs and job seekers	5	4
EU registry of available jobs and job seekers	5	4
EU index of health care providers	6	5
Services supporting portability of pensions etc.	n.a.	6
eVoting, ePolling and participation services	n.a.	7
EU electronic patient record	7	8
Pan-European emergency services	n.a.	9
Online registration of EU wide work permits	n.a.	10
EU land and real estate registry	8	11

Source: RAND Europe (2010b) 'Preferences of citizens and businesses for pan-European services'.

6.1.3. Overview of the current European e-government strategy/services

The eGovernment Action Plan 2011-2015[205], based on the Malmö Declaration[206], prioritises the following areas, in line with trends in global e-government delivery:

- Empower citizens and businesses;

- Reinforce mobility in the Single Market;

- Enable efficiency and effectiveness; and

- Create the necessary key enablers to realise these objectives in particular market applications.

Similar priorities are reflected in Pillar VII of the Digital Agenda for Europe, which identifies the following actions to "Enable ICT-based benefits to EU society":

- Action 84: Support seamless cross-border eGovernment services in the single market;

- Action 89: Member States to make eGovernment services fully interoperable (including promotion of Ipv6-based innovation); and

- Action 91: Member States to agree a common list of key cross-border public services[207].

As part of the strategy defined in the Digital Agenda for Europe and the eGovernment Action Plan, the Commission is concentrating on the development of Cross-border Digital Public Services. These build on previous initiatives, such as the 'eTEN programme'[208], and include the creation of European interoperable platforms such as a common framework for citizens' electronic identity management (eID; See Text Box 1), and the fostering of innovation through the Competitiveness and Innovation Programme (the CIP, funding Large Scale Pilots (LSPs)[209] and eParticipation projects.

The DAE objectives, in particular action 84, are characterised by a strong focus on Large Scale Pilot projects aiming at developing 'building blocks' for cross-border services and used as leverage for further development of European legal frameworks. Overall, five Large Scale Pilots for government service delivery were developed under the ICT Policy Support Programme discussed below: e-ID (STORK), e-Procurement (PEPPOL), e-Business (SPOCS), e-Health (epSOS) and e-Justice (e-CODEX), while an additional one is scheduled to be rolled

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[205] European Commission (2010d) 'The European e-Government Action Plan 2011-2015: Harnessing ICT to promote smart, sustainable & innovative Government', SEC(2010) 1539 final.

[206] Ministerial Declaration on eGovernment (2009), https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/ministerial-declaration-on-egovernment-malmo.pdf.

[207] The DAE is in itself not immune to criticism. While the assessment of the flagship initiative as a whole is outside the scope of this, study, for some critical views see e.g. the UK House of Commons review on certain aspects of the DAE, http://www.publications.parliament.uk/pa/cm201213/cmselect/cmeuleg/86-xxix/8615.htm; Marcus, J. S. & Elixman, D. (2012) Re-thinking the Digital Agenda for Europe (DAE): 'A richer choice of technologies''', LibertyGlobal and WIK Consult, on the technologies covered/ promoted by the DAE http://www.libertyglobal.com/PDF/public-policy/LGI-report-Re-thinking-the-Digital-Agenda-for-Europe.pdf; ETUC (2013) on the general perceived lack of involvement of social partners in EU2020 agenda-setting and evaluation http://www.etuc.org/a/11012; on transparency and stakeholder involvement e.g. Mansell, R. (2013) 'The European Digital Agenda: For Whom?' Presentation at 2013 EUROCPR workshop on assessing the DAE's evidence base, http://www.eurocpr.org/data/2013/Mansell.pdf.

[208] The eTEN programme, implemented between 2001 and 2006 was one of a group of Trans-European Network (TEN) initiatives directly mandated by the TEU, with the purpose of increasing integration and sustainable development of the Union through trans-European networks. The rationale for eTEN was rooted in the identified need for Trans-European Networks of eServices. In particular, it included actions aimed at services for eGovernment, eInclusion, eHealth, Trust and Security, eLearning and SMEs. Results from this project fed into the ICT LSP pilot projects and laid the foundations for networks and sector-based value chain communities leveraged in the following period.

[209] Large Scale Pilots are also referred to as 'Pilot A' projects, as is explained later in this section.

out in 2013 focusing on Basic Cross Sector Services and on the building blocks consolidated by the first LSPs. Further LSPs address other cross-border issues, such as emergency services or e-calls (HeERO). Although at the pilot scale most of these projects developed promising solutions ('building blocks'), they are currently facing the challenge of transferability and sustainability on the long-term and effective transition into the market[210].

Table 17 maps recent legislative initiatives related to the Digital Agenda actions related to these services[211]. As we can see, the actions of the European Commission are very often in the realm of soft law and pilot projects, and only a handful of actions are translated into legislative proposals or the setting up of cooperation and monitoring frameworks so far. Some notable exceptions are the e-ID and ODR frameworks (see Text Boxes 1 and 3), as well as the e-VAT and e-Customs initiative, that while having a large potential contribution to the realisation of the Single Market and the reduction of economic losses due to the illegal economy, have not managed to fully respect the planned timeframes for realising ubiquitous services (see Text boxes 2 and 4 below). It is also worth noting that while these services have the potential to enable developments of a digital single market, they also underpin each other, making possible synergies that are not always fully drawn out in policy documents[212].

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[210] The European Commission has recently commissioned studies investigating the critical sustainability of LSPs, http://ec.europa.eu/information_society/newsroom/cf//itemdetail.cfm?item_id=8451; European Parliament & European Council (1999) 'Directive 1999/93/EC of 13 December 1999 on a Community framework for electronic signatures'; European Parliament & European Council (2012) 'Proposal for a Regulation on electronic identification and trust services for electronic transactions in the internal market COM/2012/0238 final - 2012/0146 (COD)'.

[211] Adapted from: European Commission (2013c) 'Overview of progress on the 101 Digital Agenda actions and Digital Agenda Review package', https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/130606%20DAE%20actions%20progress%20incl%20review%20FINAL.doc%5B1%5D.pdf.

[212] Study on Digital Single Market Roadmap; PWC (2012) 'Implementation of the Modernised Customs Code', Study performed for the European Parliament', IP/A/IMCO/ST/2011-11; European Commission (2013a) 'A step forward for EU consumers: Questions & answers on Alternative Dispute Resolution and Online Dispute Resolution', http://europa.eu/rapid/press-release_MEMO-13-193_en.htm; Micklitz, H. & Sartor, G. (2012) 'Assessing the scope of European online dispute resolution platform', Study for the European Parliament, IP/A/IMCO/NT/2012-05; London Economics (2013b) 'From Shadow to Formal Economy: Levelling the Playing Field in the Single Market', Study for the European Parliament, IP/A/IMCO/ST/2012-18.

Table 17:   Relevant Digital Agenda legislative actions

Action number and title	Responsible DGs	Initiative
008 Key Action 3 - Revision of the eSignature Directive	CNECT	Legislative proposal adopted on 6 July 2012, coupled with e-ID following the Single Market Act.
011 Member States - Transpose the VAT Directive	TAXUD	Council adopted a Directive (2010/45/EU amending Directive 2006/112/EC)[213] which sets out new VAT rules for e-invoicing and removes the obstacles to the uptake of e-invoicing by creating equal treatment between paper and e-invoices - also ensuring that no additional requirements are imposed on paper invoices.
014 Alternative Dispute Resolution Green paper /Online Dispute Resolution	SANCO	Directive on alternative dispute resolution (ADR) for consumer disputes[214] and Regulation on online dispute resolution (ODR) for consumer disputes adopted on 22 April 2013[215].
083 Key Action 16 - Council and Parliament Decision on mutual recognition of e-ID	CNECT	(Merged with Action 8) Legislative proposal adopted on 6 June 2012, coupled with eID following the Single Market Act.

Table 18:   Soft law actions by the European Commission in the area of ubiquitous services

Action number and title	Responsible DGs	Initiative
009 Proposals on e-Commerce Directive	MARKT; SANCO; CNECT	Communication adopted on 11 January 2012[216]. It was deemed unnecessary to revise the eCommerce Directive at this point. Commission to provide some guidance on interpretation (notice & action). This action is linked with action 104 (eCommerce action plan)
017 Stakeholder platform for EU online trustmarks	CNECT	The Commission finalised a study[217] in early 2013 as a basis for further steps; future actions under consideration

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[213] European Council (2010) 'Directive 2010/45/EU of 13 July 2010 amending Directive 2006/112/EC on the common system of value added tax as regards the rules on invoicing'.

[214] European Parliament & European Council (2013) 'Directive 2013/11/EU of 21 May 2013 on alternative dispute resolution for consumer disputes and amending Regulation (EC) No 2006/2004 and Directive 2009/22/EC'.

[215] European Parliament & European Council, 2013.

[216] European Commission (2012a) 'A coherent framework for building trust in the Digital Single Market for e-commerce and online services', COM(2011) 942 final.

[217] TNO & Intrasoft International (2012) 'EU Online Trustmarks Building Confidence in Europe. Final report', Study for the European Commission, http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=1815.

Action number and title	Responsible DGs	Initiative
024 Adopt a European Interoperability Strategy and European Interoperability Framework	DIGIT	Adopted 16 December 2010. Follow-up of this action is as follows: - European Interoperability Reference Architecture[218] and European Cartography of Interoperability solutions[219]: the action will develop a common reference architecture of cross-border interoperability and identify existing operational interoperability solutions (services, ICT systems, software components, semantic, organisational and legal interoperability assets). Once completed the description provides a cartography mapping existing operational European interoperability solutions. This cartography will raise awareness of PAs on what exists to be re-used and under which conditions. - European Federated Interoperability Repository (EFIR)[220]: the EFIR will be the dissemination tool for the European Cartography of Interoperability solutions. It will document and make available information about Interoperability solutions and their four characteristics. The repository itself will become a valuable information source, which can be used by the Member States and European Commission services to boost interoperability. It will also serve as a tool to identify challenges and alignment opportunities for IOP asset and ISs management at a European level.
025 Measures to license interoperability information	CNECT	Following a public consultation on Access to Interoperability Information of Digital Products and Services, no legislative action will be proposed during this mandate. Follow-up actions include soft measures centered on best licensing practices and model licences.

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[218] ISA, 'Towards a European Interoperability Architecture', http://ec.europa.eu/isa/actions/02-interoperability-architecture/2-1action_en.htm.

[219] ISA, 'Assessment of Trans-European networks supporting EU policies', http://ec.europa.eu/isa/actions/02-interoperability-architecture/2-14action_en.htm.

[220] ISA, 'European Federated Interoperability Repository', http://ec.europa.eu/isa/actions/04-accompanying-measures/4-2-4action_en.htm.

Action number and title	Responsible DGs	Initiative
054 Develop a new generation of web-based applications and service	CNECT	Action plan for web entrepreneurship announced in the Digital Agenda Review.
056 Member States - Engage in large scale pilots financed by the CIP	CNECT	Eight large scale pilots involving Member States launched based on the CIP ICT Policy Support Programme have or are in the process of being launched
073 Member States - Agree common additional functionalities for smart meters	CNECT, ENTR,ENER	Commission presented a set of functionalities agreed by 11 Member States in October 2011. Commission Recommendation to Member States adopted in February 2012, it is currently being implemented and monitored
075 Key Action 13 - Secure online access to medical health data and wider deployment of telemedicine	CNECT, SANCO	Two pilots funded under CIP programme. The e-Health action plan 2012-2020 was launched December 2012 to address barriers to widespread telemedicine deployment
077 EU-wide standards, interoperability testing and certification of eHealth	CNECT	In 2013, the Commission will Propose the European e-Health Interoperability Framework[221] for endorsement by the eHealth Network; Propose specifications for their identification by the ICT standards multistakeholders platform for their endorsement by the eHealth Network and inclusion in the Interoperability Framework (recurring activity).
084 Seamless cross-border eGovernment services in the single market	CNECT (timeline 2015)	The Commission facilitated the exchange of views with the Member States to identify which new cross-border services could be piloted under the CIP ICT PSP programme and which services could be rolled out in 27 Member States. In April 2013 the Commission launched eSens[222], a new Large Scale Pilot on Basic Cross Sector Services. This Pilot will focus on all the building blocks developed by other Large Scale Pilots.

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[221] ISA, 'Bringing cross-border interoperability to healtcare', http://ec.europa.eu/isa/actions/02-interoperability-architecture/2-12action_en.htm.

[222] e-Sens, http://www.esens.eu/home.html.

Action number and title	Responsible DGs	Initiative
086 Implement cross-border eEnvironment services	ENV	A Commission Staff Working Document - SEIS Implementation Plan (January 2013)[223] -outlined priorities and improved co-ordination of mutually supportive activities
087 Communication on "A Strategy for eProcurement (White Paper on inter-connecting eprocurement capacity in EU)	MARKT	Commission Communication 'Strategy for e-procurement' adopted 20 April 2012[224].
088 eCommission 2011-2015 action plan	DIGIT	Commission Communication 'e-Commission 2012-2015' adopted 1 August 2012[225].
089 Member States - Make eGovernment services fully interoperable	CNECT	The Commission has undertaken steps to ensure MS align their national interoperability frameworks with applicable European frameworks and develop more effective and efficient interoperable public services as agreed in the Malmo and Granada declarations. This issue is also tackled in CEF.
090 Member States - Points of Single contact function as fully fledged eGovernment centres	MARKT	The Commission published a study (2012) on PSCs to assess the level of development of the Points of Single Contacts created by the Services Directive
091 Member States - Agree a common list of key cross-border public services	CNECT	A Ministerial Roundtable in November 2011 in Poznan identified five key cross-border services[226]. Agreement with Member States reached 2013.

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[223] European Commission (2013b) 'On EU Shared Environmental Information System Implementation Outlook', SWD(2013) 18 final.

[224] European Commission (2012b) 'A strategy for e-procurement', COM(2012) 179 final.

[225] European Commission (2012c) 'e-Commission 2012-2015', SEC(2012) 492 final.

[226] Digital Agenda for Europe, 'Action 91: Member States to agree a common list of key cross-border public services', http://ec.europa.eu/digital-agenda/en/pillar-vii-ict-enabled-benefits-eu-society/action-91-member-states-agree-common-list-key-cross.

Action number and title	Responsible DGs	Initiative
120 Key Transformative Action: Establishment of the European Cloud Partnership to harness public buying power to accelerate the development of the market for cloud computing	CNECT	European Cloud Partnership[227] launched on 17 November 2012.
121 Follow up of the European Cloud Computing Strategy	CNECT	In September 2012, the Commission published a Cloud computing strategy[228]. The Commission will report on the implementation of the strategy at the end of 2013. It is also looking into how to enhance the strategy further. This action is complemented by Action 122.

A few actions regarded the current and future planned pilots and LSPs (see Table 19).

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[227] Digital Agenda for Europe, 'European Cloud Partnership', https://ec.europa.eu/digital-agenda/en/european-cloud-partnership.

[228] Digital Agenda for Europe, 'European Cloud Computing Strategy', https://ec.europa.eu/digital-agenda/en/european-cloud-computing-strategy.

Table 19: Actions related to pilots by the European Commission

Action number and title	Responsible DGs	Initiative
026 Member States - Implement European Interoperability Framework at national level	DIGIT	The Commission will assist Member States in adopting the European Interoperability Strategy and a European Interoperability Framework (EIF) through supporting actions, including awareness raising and exchange of information on national interoperability frameworks. It has launched a study in 2012 on the needs and costs benefits of crossborder services and the existing barrier. The results of the first CIP ICT PSP Large Scale Pilots are being deployed across Member States. This is an on-going action
110 Deploy and roll out digital services in key areas of public interest	CNECT	On the 1st April 2013, the new Large Scale Pilot (LSP) 'Electronic Simple European Networked Services' - e-SENS[229] was launched, focused on strengthening the digital single market and facilitating public services across borders.
122 Launch pilot action to explore the efficiency gains from moving public services into the Cloud	CNECT	The ICT PSP Work Programme 2013[230] will finance pilots for up to 18M€ of total EU contribution.

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[229] Peppol, 'e-SENS "Electronic Simple European Netowrked Services launched", http://www.peppol.eu/news/e-sens-201celectronic-simple-european-networked-services201d-launched.

[230] Competitiveness and Innovation Framework Programme (CIP) (2013) 'PSP Work Programme 2013', https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/cip_ict_psp_wp2013_publication.pdf.

Text box 1: e-IDs and trust services

Although e-IDs were indicated by citizens and businesses as a European service that they would welcome and eventually be ready to pay for, there is a lack of a common legal basis engaging each Member State to recognise and accept e-IDs issued in other Member States. The insufficient cross-border interoperability of national e-IDs prevents citizens and businesses from benefitting fully from the digital single market. Potential gains from the implementation of pan-European eId and trust services have been estimated to amount to more than EUR 15-30 billion due to the size of the enabled market in public procurement and between EUR 0.5–1.5 billion through increasing consumer surplus[231]. While solutions to gaps in technical and organisational interoperability have been developed in the on-going cross-border Large Scale Pilot on eID (STORK 2.0), the lack of a common legal basis for cross-border mutual recognition of e-IDs persists[232].

Similarly, although e-Signatures (indicated in our survey as a service of fundamental importance for businesses) have been supported by the e-Signatures directive, cross-border business activities will be enabled only if the full range of trust services connected to these transactions, including trust marks and electronic seals is implemented.

The Commission's current proposal on trust services, adopted on 6 July 2012, is expected to increase the visibility of these services in the e-Government agenda and leverage the contributions of the STORK pilot. It proposes a Regulation to ensure mutual recognition and acceptance of electronic identification across the EU and the interoperability and usability of electronic signatures, as well as the cross-border dimension of services such as electronic document delivery and website authentication. In order to respect subsidiarity, the Regulation would concentrate on mutual acceptance and recognition of national systems rather than introducing an EU-wide system, although such solutions will lead to fragmented coverage of the Digital Single Market by e-ID schemes. The proposal mainly aims at implementing these services through imposing new obligations on Member States regarding acceptance of e-IDs and provision of online free ID data, authentication facilities, accompanied by a standardisaiton mandate. Member States may also invite the private sector to make use of the national e-ID systems.

ISA / European Interoperability Framework (EIF)

The 2010-2015 Interoperability Solutions for European Public Administrations Programme, building on the 2005-2009 IADBC programme[233], aims to foster interoperability between public administrations by helping to establish common approaches that facilitate collaboration, supporting for instance the goals set out in Malmo and in Action 89 of the DAE. Promotion of the interoperability of electronic public services forms the first pillar of the ISA programme, under which it supports Member State action in alignment with the European Interoperability Framework (EIF). The EIF is a set of guidelines for the establishment of interoperable public services. The EIF takes into account aspects such as legal compatibility, semantic interoperability, technical aspects (system architecture) of information systems, organisational cooperation, and a favourable political climate, all considered necessary for realising interoperable European public service delivery[234].

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[231] Economisti Associati, 2012.

[232] Graux, H. (2012) 'Stork 2.0 Legal Needs Analysis report, Deliverable 3.1', https://www.eid-stork2.eu/index.php?option=com_jdownloads&Itemid=107&view=viewdownload&catid=4&cid=30.

[233] Interoperable Delivery of European eGovernment Services to public Administrations, Businesses and Citizens (IDABC), http://ec.europa.eu/idabc/.

[234] European Commission (2010a) 'Annex 2 to European Interoperability Framework (EIF) for European Public Services', COM(2010) 744 final, http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf.

CIP ICT-PSP

The ICT PSP is a funding programme created in 2006 within the Competitiveness and Innovation Framework Programme (CIP) and runs from 2007 to 2013[235]. Its particular focus is to support actions that contribute to progress towards the goals of the Digital Agenda for Europe and its funding initiatives are structured along the DAE priorities. The overall objectives of the CIP-PSP Programme are to support the EU policy for eGovernment as agreed in the eGovernment Action Plan by:

- Improving the efficiency and effectiveness of public administrations and facilitating the interactions of citizens and businesses with them;

- Opening up new market opportunities for innovative ICT based solutions for governments and administrations;

- Strengthening and broadening citizens' participation in decision-making, and contributing to better legislation through the use of innovative ICT based solutions.

The ICT PSP covers technological and non-technological innovations that have moved beyond the final research demonstration phase. Hence, it aims at stimulating smart sustainable and inclusive growth by accelerating the wider uptake and best use of innovative digital technologies and content by citizens, governments and businesses. The CIP ICT PSP supports five different types of initiatives:

- Pilot (Type A) - building on initiatives in Member States (MSs) or associated countries, also known as Large Scale Pilots with a focus on interoperability-discussed above;

- Pilot (Type B) - stimulating the uptake of innovative ICT based services and products;

- Thematic Network (TN) - providing a forum for stakeholders for experience sharing and consensus building;

- Best Practice Network (BPN) - support sharing of best practices in the field;

- PPI Pilot – Public Procurement of Innovative solutions (PPI) – supporting public procurement as a driver for the deployment of innovative solutions.

Recent PSP calls have had a pronounced element of support for eGovernment and public service delivery under Theme 4: ICT for innovative government and public services. In 2011, this included funding for pilots in cloud, IPv6 use, and eIDs, with an overall budget of EUR 21.5 million. In 2012, the focus was on the future of the LSPs, with a total budget of EUR 20 million. They opened calls for the new pilot on cross sector services as well as the extension of the eCODEX and HeEro pilots. The current, seventh call focuses on cloud services (EUR 32.5 million), trust and Digital content (EUR 7 million), and open data and creativity (EUR 36 million). The work plan includes EUR 18 million funding for pilots in Public service Clouds to provide a set of use cases and best practices, which could be broadly deployed as Digital Service Infrastructures under the proposed Connecting Europe Facility (CEF). The pilots could address the reuse of services already deployed under existing CIP Pilots A[236].

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[235] European Parliament & European Council (2006), 'Decision No. 1639/2006/EC of24 October 2006 establishing a Competititveness and Innovation Framework Programma (2007 to 2013).
[236] CIP 2013.

Research governance

After a continued role for eGovernment in FP6, the actual need for further RTD activities under FP7 was discussed extensively between the Commission and the Member States, with individual ICT FP7 calls focusing on different aspects of ICTs and e-Government, including policy modelling and public clouds[237]. The European Commission has conducted a public consultation with regards to the formulation of research priorities for Horizon 2020 in support of ICT-driven public sector innovation. The results of the consultation appear to support an increased focus on ubiquitous aspects, including open government, big data, Web 2.0 and Web 3.0 applications[238].

European cloud strategy

In September 2012, the European Commission adopted a strategy for 'unleashing the potential cloud computing in Europe'[239]. The strategy was designed to speed up and increase the use of cloud computing throughout all sectors of the economy which should contribute to the cutting of ICT costs, and (when combined with new digital business practices) boost productivity, growth and jobs.

A study conducted for the Commission by IDC[240] noted that the use of cloud services was progressing well in Europe, but identified a number of impediments that might become significant over time. "There is clearly a cluster of strongly correlated barriers, ranking high in relevance both in the medium and long term for all business users. This creates a negative cumulative impact on cloud adoption and short-term plans. These barriers concern unclear legal jurisdiction and data location issues, complex security and data protection regulations, uncertain trust in suppliers, and lack of guaranteed data access and portability between cloud systems. This shows that uncertainties about the way legal and security issues are managed in the cloud environment are strongly correlated with uncertainties about the relationship with and the trustworthiness of cloud providers."

The Commission identified three key areas in which it found that action was needed in order to optimally benefit from cloud computing technologies: a) fragmentation of the digital single market due to differing national legal frameworks, b) problems with contracts due to worries over data access and portability, change control and ownership of the data, and c) the jungle of standards and lack of certainty as to interoperability. Many of the necessary steps to make Europe cloud-friendly were already identified as actions of the Single Market Pillar of the Digital Agenda for Europe and the 'Single Market Act'[241] (e.g. simplify copyright clearance, management and cross-border licensing) and are currently being progressed through other European initiatives.

In addition to these steps, the European Commission launched three cloud-specific actions: 1) cutting through the jungle of standards, 2) safe and fair contract terms and conditions and 3) establishing a European Cloud Partnership[242] to drive innovation and growth from the

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[237] For instance, the 2013 Call 7 concentrated on innovation in Pre-commercial procurement for applications such as e-government or public clouds (objective 11.3) while for instance call 4 had focused on ICTs for Governance & Policy Modelling, including advanced cooperation platforms and tools (Objective 7.3), European Commission (2012e) 'ICT – Information and Communication Technologies Work programme 2013', http://cordis.europa.eu/fp7/ict/docs/ict-wp2013-10-7-2013-with-cover-issn.pdf.

[238] European Commission (2013e) 'Report of online public consultation: research and innovation at EU level under Horizon 2020 in support of ICT-driven public sector innovation', https://ec.europa.eu/digital-agenda/en/news/consultation-directions-ict-driven-public-sector-innovation-eu.

[239] DAE, 'European Cloud Computing Strategy'.

[240] Bradshaw, D., Folco, G., Cattaneo, G. & Kolding, M. (2012) 'Quantitative Estimates of the Demand for Cloud Computing in Europe and the Likely Barriers to Up-take', IDC, 13 July.

[241] European Commission (2011d) 'Single Market Act: Twelve levers to boost growth and strengthen confidence "Working together to create new growth"' COM (2011) 206 final.

[242] DAE, 'European Cloud Partnership'.

public sector. The Commission also implemented a series of flanking actions to support these key actions, such as the identification of how full use can be made of other available instruments notably through research and development support under Horizon 2020. Another action concerns the launch of Digital Service Infrastructures under the proposed Connecting Europe Facility in 2014 as ubiquitously available cloud-based public services for e.g. setting up business online; cross-border procurement and eHealth services. Finally, the Commission will take action to promote e-skills and digital entrpreneurship with regard to cloud computing.

6.1.4. EU Policy and the four priorities

The four priorities defined for eGovernment in the action plan are directly applicable for other ubiquitous policies at the European level, in particular with regards to the barriers and context of implementation.

With regards to empowerment and transparency, an important proportion of EU-wide and national initiatives and use cases, e.g. the cases collected by the ePractice initiative have focused on this objective. European consumers can be empowered by services connected to consumer protection (for instance by the creation of single point sof contact for providing assistance). Furthermore, open government and open data have been projected to have a substantial contribution to the EU economy, of up to EUR 40 billion yearly[243]. However, pan-European citizen surveys and the low level of take-up and satisfaction with these services[244] have underlined the necessity of understanding the link between user-centricity, user satisfaction and trust in the system, as well as the influence of several other factors on the level of and limits to empowerment of users (including overall trust in government services, awareness, and access (among others))[245].

With regards to the Single Market, although tools demanded by citizens would have a clear connection to cross-border movement and business transactions, e-Government or other cross-border services by themselves are unlikely to further stimulate (cross-border) mobility of people and/or labour. Impediments to developing services addressing Single Market needs are often caused by prohibiting or conflicting regulations at national and EU level, or even the lack of regulation or legal embedding, as has been experienced with earlier pan-European applications and current LSPs, reflected in the EC's definition of their mission to leverage LSPs as a motive for revision of the legal framework. However, the successful implementation of ubiquitous services it may facilitate single market integration by making mobility cheaper and less burdensome by reducing complexity of processes.

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[243] European Commission (2011b) 'Digital Agenda: Turning government data into gold' http://europa.eu/rapid/press-release_IP-11-1524_en.htm.

[244] European Commission (2013d) 'Public Services Online, Assessing User Centric eGovernment performance in Europe – eGovernment Benchmark 2012 Background Paper', https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/eGov_Benchmark_2012%20background%20report%20published%20version%200.1%20.pdf.

[245] European Commission, 2013d.

Efficiency and effectiveness

Although the successful implementation of e-Government services is often projected to have substantial potential for public sector savings (projected to be worth up to EUR 50 billion per year)[246], and studies have found that users are also willing to bear part of the costs, the net balance of implementation costs and direct or indirect benefits is not always unequiivocally predictable.

Key enablers

With regard to key enablers, the e-Government Action Plan specifically focuses on enablers for the provision of cross-border public services, in particular eSignatures and e-ID. Other European initiatives focus on key enablers of ubiquity where the differences persisting between Member States most probably warrant action at European level. These include standards and interoperability addressed by the previously mentioned ISA, and the Competitiveness and Innovation Framework Programme (CIP) Large Scale Pilots (LSPs) as well as the JOINUP platform[247] focusing on semantic interoperability and open source software. The Connecting Europe Facility (CEF) proposed by the European Commission could become a new investment instrument, which also creates a digital infrastructure for public services; however, even in the presence of technological initiatives, one must not forget that the obstacles to efficient cross-border services are mainly legal and political (as well as being able to raise the necessary investment capital), rather than technical.

Text box 2: e-VAT

E-commerce, in particular the exchange of digital content and clouds, offers an outstanding possibility for the realisation of the digital single market; however, the spread of cross-border e-commerce is hampered by a series of barriers. One of the most important barriers is the fragmentation of European VAT systems across countries and groups of distributors/suppliers or varieties of products (such as the physical and digital versions of the same good). The revision of the VAT system, including the introduction of e-invoicing, was the objective of a 2010 Directive, and its realisation is one of the focal points of the Digital Agenda. Increased digitalisation of VAT compliance not only offers substantial scope for reducing compliance costs for traders, but also potentially could reduce the VAT tax gap by improving VAT collection systems by means of digitalised compliance procedures. Projected benefits from improving the collection system range from EUR 1.574 to 2.038 billion[248].

One such initiative is the 'one-stop shop' scheme, whereby a business could opt to account for VAT across the EU via a single electronic declaration. The scheme has already been operational for non-EU B2C electronically supplied service providers since 2003. It is currently being rolled out for B2C telecommunications, broadcasting and electronically supplied service providers established in the EU, to be available after January 2015. The main purpose of the scheme is to simplify compliance requirements by avoiding the need for multiple-country VAT registration, which otherwise would be necessary; however, it does not cover certain elements that would greatly increase its efficiency, such as VAT audit harmonisation, currently carried out by the 27 national authorities. Similarly, a potential agreement to harmonise the format of data output and to implement novel VAT collection

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[246] Digital Agenda for Europe, 'Public Services', https://ec.europa.eu/digital-agenda/en/public-services.
[247] European Commission, 'Joinup', https://joinup.ec.europa.eu/.
[248] London Economics, 2013b.

models in the one-stop shop could greatly increase collections; however, it has not been put in place yet[249].

Despite promising progress, evaluations of the customs union and past experiences have found the cost and operational efficiencies made possible by the implementation of e-Vat systems are limited by differing Member State capabilities to implement IT-based solutions in the remaining areas of cross-border digitalisation, such as VAT refunds.

Overall, although the EC programmes emphasise development of cross-border EU-level ubiquitous e-Government services and their priorities largely align with recent trends in eGovernment service delivery, they have not yet demonstrated sustainable and scalable uptake despite the existence of demand and willingness to pay from the user side (including both individuals and businesses) not least because of different socio-economic conditions persisting across Member States as well as policy fragmentation. Therefore, services developed and delivered at the Member State or at the local level are likely to show more potential of successful ubiquitous development in the near future.

Text box 3: Online Dispute Resolution

The EU's recently introduced Online dispute resolution (ODR) system is a potential example of successful extension of a service to a ubiquitous level. Alternative dispute resolution (ADR) helps consumers resolve disputes with traders when they have a problem with a product or service that they bought, e.g. when a trader refuses to repair a product or to make a refund to which a consumer is entitled. Online dispute resolution is a potential tool for reducing the costs and facilitating the functioning of dispute resolution.

Within the new framework, all Member States have to provide full ADR coverage for all sectors (except health and education). This act (as a result of modifications proposed by the European Parliament) has been designed to be accompanied by an EU-wide ODR system available to all EU consumers and traders. As a result, by 2015 the ODR Regulation will enable EU consumers and traders to submit disputes arising from online purchases to ADR online, thanks to the EU-wide dispute resolution platform ('ODR platform'). The ODR platform will link all the national ADR entities, and speed up their operation. This single entry point is designed to be a user-friendly and interactive website, available in all EU official languages and free of charge. Online traders will also provide an electronic link to the ODR platform on their websites to inform consumers. The ultimate goal of the intiative is to promote confidence in e-commerce and the protection of consumers in the Digital Single Market, projected to enable EU consumers to save EUR 22.5 billion a year on losses due to problems encountered when buying goods in the Single Market[250].

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[249] Digital Agenda for Europe, 'Action 11: Member States to transpose the VAT Directive', https://ec.europa.eu/digital-agenda/en/pillar-i-digital-single-market/action-11-member-states-transpose-vat-directive; European Council (2010) 'Directive 2010/45/EU of 13 July 2010 amending Directive 2006/112/EC on the common system of value added tax as regards the rules on invoicing; Naess-Schmidt et al. (2012) 'Simplifying and Modernising VAT in the Digital Single Market for e-Commerce', Study for the European Parliament, IP/A/IMCO/ST/2012_03; European Commission (2009c) 'Action Programme for Reducing Administrative Burdens in the EU Sectoral Reduction Plans and 2009 Actions', COM(2009) 544; European Commission (2011e) 'Towards a Simpler, More Robust and Efficient VAT System Tailored to the Single Market', COM(2011) 851 final.

[250] European Commission (2013a); Micklitz & Sartor, 2012.

Text box 4: E-Customs

The European Union is the largest customs union in the world, with an internal market of some 500 million citizens. 17% of world trade, 2.2 billion tonnes of goods with a customs value of EUR 3300 billion, was handled by EU customs in 2011, involving millions of customs declarations. The concept of an electronic environment for customs (e-Customs) was announced in 2004. One year later, the European Commission adopted two proposals to modernise the EU Customs Code and to introduce an electronic, paper-free customs environment in the EU.

The aims of the e-Customs programme are to facilitate trade, support European competitiveness, and enhance security at the EU's external borders through the following means:

- Facilitate import and export procedures;

- Reduce compliance and administrative costs;

- Improve clearance times;

- Coordinate the approach to the control of goods and application of the legislation;

- Ensure proper collection of duties and charges;

- Enable a seamless flow of data between the parties involved and allow re-use of data.

Operational planning of the e-customs initiative and the allocation of the tasks to the Commission and the Member States is provided in the Multi-Annual Strategic Plan (MASP), which is the overall project management tool for 27 customs administrations operating as one entity within the customs union. While the MASP sets requirements on the exchange of data among Member States, the processing of import, export, and other trade declarations is a national matter and is handled by national Declaration Management Systems (DMS).

Among the projects already implemented, the Automated Import System and Automated Export System together with NCTS seek to ease the customs procedures (export, import and transport), avoiding duplication of procedures at EU level, while the assessment of risks is covered by connection to the Common Customs Risk Management Framework (CRMF), supported by the central Common Customs Risk Management System (CRMS).

Several other tools were included in the planning, but are at less developed stages of implementation. One of these is the Single Window, projected to enable traders to lodge electronically and once only all the information required by customs and non-customs legislation for EU cross-border movements of goods. The envisaged national single windows would be connected to one another, and would be supported by the Single Electronic Access Point (SEAP). Similarly, the proposed umbrella registration and authorisation systems, such as Single Authorisations for Simplified Procedures aim at further cutting red tape for businesses. Amongst others, it has been concluded that implementation of the MCC and realisation of the u-services envisioned in it largely depends on the IT strategy for information transfer, that should be followed for the next decade[251].

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[251] PWC, 2012.

The Commission has conducted periodic revisions on implementation and evaluation of the progress towards the goals of the revision of the Customs Union (including e-Customs) since 2008. Only in a few areas has the implementation of e-Customs been a success. For instance, systematic automatic risk analysis on the basis of electronically submitted data from trade in advance of the entry and exit of goods has been performed since 2011. Furthermore, all national customs authorities now offer the possibility to submit the customs declarations electronically. Overall, more than 90% of all customs declarations in the EU today are made electronically.

Nonetheless, several actions envisioned in the MCC, MASP and the Directive on paperless customs environment have not been fully implemented; thus, the original deadline of June 2013 was not met (e.g. for the Single Window or Single Authentication systems). Moreover, the main policy and legislative documents are currently awaiting a recast that takes into account feedback from the Council on the overall progress of the Customs Union and developments that have taken place in recent years[252]. The delay in implementation has been estimated to cost up to 2.5 billion EUR annually in foregone savings from lower compliance costs, and as much as 50 billion EUR in an expanded international trade market[253].

Although the limited number of countries examined means that our mapping of potential u-services can not be comprehensive, some examples, such as the use of e-Procurement in the UK and eIDs in Estonia, illustrate the benefits of well-embedded u-services to businesses and citizens. Furthermore, it can be seen that in many cases (for instance in the case of e-Helath and e-Prescriptions) different solutions are being sought and implemented in different EU Member States. While this might lead to inefficiencies due to duplication of efforts, the potential dynamic benefits of continuous improvement, mutual learning and benchmarking made possible by the coexistence of different approaches also have to be taken into account.

However, what emerges from even a limited snapshot is that there is some overlap between European-level and national-level services, and within national-level services, and their equivalents at different level of government as well. This could lead to confusion and limited awareness of their availability and functionality by users, potentially hampering the effectiveness of the services themselves. To facilitate navigation between services, several countries have put into place single online entry points (similarly to Your Europe and Europa in the EU), such as the gov.uk portal in the United Kingdom; however, on the general level it seems that the landcape of online services is characterised by a high level of disaggregation and unclear information throughout the EU, both in the case of EU- and national-level services[254].

The level of ubiquity of these different services (based on the criteria listed in Chapter 1 of this report) varies across the EU initiatives. While the original conceptual architecture behind most of these initiatives is characterised by an attention to several aspects of ubiquity (for instance the idea of guaranteeing ubiquitous emergency services accessible to everyone in the EU, or breaking down barriers to information sharing among judicial

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[252] European Commission (2012) 'Taxud.a.3 ARES (2012) 1008474 Working document: Electronic Customs Multi-Annual Strategic Plan 2012 revision', http://www.shipsupply.eu/image/inhalte/file/Draft_MASP_rev11_main%20body%20v%201_0%20-%20for%20external%20review.doc; European Commission (2012j) 'State of the Customs Union', COM(2012) 791 final; European Council (2012) 'Conclusions on the Progress on the Strategy for the Evolution of the Customs Union 3208th COMPETITIVESS (Internal Market, Industry, Research and Space) Council meeting', Brussels, 10 and 11 December.

[253] London Economics, 2013b.

[254] London Economics (2013a) 'A European Single Point of Contact', Study for the European Parliament IP/A/IMCO/ST/2012-17.

administrations with eCODEX), these initiatives encounter several barriers in user takeup and awareness; the practical implementation of technological and semantic interoperability or delays in the decisionmaking process. For instance, while the eCall emergency service piloted in the HeERO pilot is a potentially promising initiative for creating a truly cross-border service, the implementation shows significant delays and public awareness surrounding the availability of the 112 emergency number is limited in itself[255]. Ubiquity in this case is not necessarily limited by the planned characteristics of the service but by delay and limitations of the scope of the initiative in the implementation phase as well as in awareness-raising among end-users.

User awareness and willingness to engage with the service had also been indicated as a barrier to takeup in other services, such as eSignatures. Similarly, while e-Invoicing has a potentially large contribution to the single market and is among the services that European businesses expressed astrong demand for, European initiatives until very recently were limited to the provision of a multistakeholder platform. Furthermore, due to delays in the reform of European VAT systems and the added complexity of different regimes regarding practices for archiving and accounting, data protection and electronic signatures, e-Invoicing has not succeeded in becoming a ubiquitous facility. Furthermore, e-invoicing also illustrates the importance of embedding ubiquitous services in the context of digital business and document processes such as accounting and bookkeeping[256]. Some other services, such as the e-CODEX LSP demonstrate the barriers to ubiquity represented by translation and semantic interoperability issues, even as the system in itself aims at streamlining processes and reducing administrative burdens by avoiding changes to the legal framework of individual countries. At the same time, the differences in legal systems, as with the previous examples, continue to challenge interoperability, while in the absence of top-down standardisation procedures any interoperabiltity framework is hindered by the evolution of Member States' own ICT systems used to manage the databases that are supposed to be connected in the pilot- a problem that also emerges in the case od e-IDs[257]. In other cases, limitations stem from the policymaking process; such as illustrated by the examples of the delayed e-Customs and e-VAT reforms.

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[255] See e.g. European Parliament resolution of 3 July 2012 on eCall: a new 112 service for citizens (2012/2056(INI)); Eurobarometer (2012b) 'The European Emergency Number 112', Flash Eurobarometer 314, indicated that onyl 26% of the surveyed could indicate 112 as the number to call emergency services from anywhere in the EU.

[256] European Multistakeholder Forum on Electronic Invoicing (2012) 'Solutions for Remaining Cross-Border Issues', http://ec.europa.eu/internal_market/payments/docs/einvoicing/activity3-2012_09_26_en.pdf.

[257] Carboni, N., Velicogna, M. (2012) 'Electronic Data Exchange Within European Justice: e-CODEX Challenges, Threats and Opportunities', International Journal For Court Administration, December.

Table 20:   EU initiatives corresponding to solutions in examined countries

Service	Countries examined in this study	Corresponding EU initiative
e-health; e-prescriptions	Estonia; Canada; the Netherlands; UK; Germany	epSOS (LSP)
e-Tax	Estonia; the Netherlands	
Mobile parking; i-mobility	Estonia	
e-ID, Mobile ID	Estonia; Canada; the Netherlands	STORK (LSP)
e-Election	Estonia	
Business registry	Estonia; the Netherlands	EUGO (Platform)
Population registry; civil registry	Estonia; Germany; the Netherlands	
e-signatures	Estonia; Germany	eSignatures (legislative initiative)
Smart Grid	Estonia; US; UK; Germany	
e-Learning	South Korea; Japan; Estonia; Germany	
e-Procurement	South Korea; UK	PEPPOL (LSP); e-Invoicing (legislative initiative and soft law)
Smart cities	South Korea; Japan; Germany; UK	
e-Government; state e-services	Estonia; Germany; the Netherlands	eCommission (Soft law; Internal strategy)
Location-based services (e.g. emergency services)	Estonia	eCall and HeERO (LSP)
Interoperability	Estonia	EIF (Coordinating action)
Services to job seekers	UK; Germany; the Netherlands	EURES (Service)

Service	Countries examined in this study	Corresponding EU initiative
Secure electronic communications	Germany; EU institutions	sTESTA (Network)
e-Customs	The Netherlands	e-Customs (Legislative initiative; implementation postponed until 2020)
e-Justice	The Netherlands	e-Codex (LSP); ODR, Solvit, Your Europe advice (non-judiciary/alternative resolution platforms)
Cloud	UK; the Netherlands	European Cloud Partnership

6.1.5. Assessment of European programmes to integrate and modernise e-Government

Based on our initial review of public services in various Member States, we would have been inclined to assume that there was a lack of action at European level to join up the fragmented public services activities at Member State level. In fact, there does not appear to be a substantial shortage of programmes or action lines at European level. For nearly every need that we have identified, some action line already exists. Our concern is thus not with a lack of programmatic response; rather, it is that the action lines in place individually and collectively do not appear to be having much effect on the problem.

Our terms of reference did not explicitly call on us to assess the effectiveness of existing European programmes in this space; however, we found it necessary to understand them in order to make recommendations going forward. We are able to make a number of preliminary and general observations based on various assessments that have been made, including (1) a 2012 study for IMCO by Economisti Associati, 'Roadmap to Digital Single Market: Prioritising Necessary Legislative Responses to Opportunities and Barriers to e-Commerce'; (2) the Parliament's own 20 April 2012 resolution 'A compatititive digital single market - eGovernment as a spearhead'[258]; and (3) a May 2013 study by CapGemini et al., 'Public Services Online: 'Digital by Default or by Detour?', Assessing User Centric eGovernment performance in Europe – eGovernment Benchmark 2012'.

Taken as a whole, European policy in this space seems have somehow had little effect to date. Some of the programmes are too new; others have little effect despite being in place for many years. It is difficult to identify a single programme that has already worked as it ideally should.

- *Customs:* The modernised customs code that was originally scheduled for implementation in 2013 was intended to address need for traders operating in more than one Member State to comply with different procedures, data and protocol requirements. The intent was to enable traders to file their declarations and notifications directly with customs from their own IT system and eventually be linked one day to secure internet payment systems. Unfortunately, as a result of technical difficulties and related costs, the Commission has proposed to postpone the deadline for implementation to 2020[259].

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[258] European Parliament (2011a) 'Competitive digital single market - eGovernment as a spearhead', 2011/2178(INI).

[259] Economisti Associati, 2012, p. 15.

- *V.A.T.:* Similar concerns could be raised as those with customs. Increased digitalisation of VAT compliance not only offers substantial scope for reducing compliance costs for traders, but also potentially could reduce the VAT tax gap by improving VAT collection systems by means of digitalised compliance procedures. Directive 2010/45/EU was seen as a positive step, and the need for one stop shops is acknowledged, but much work needs to be done.

- *eID and authentication services:* e-Identification services are in principle a fundamental enabler that would likely have a positive effect on e-payment systems, cloud computing, e-government (especially cross-border), and trade in general. As noted in 'Roadmap', "…the revision of the e-signature directive that was long considered mainly as a consumer's confidence-building measure, has increasingly come to be a supplyside measure as it removes cross-border obstacles to access to e-government, simplifies e-invoicing and favours the establishment of trusted services." It has been argued that the previous e-signature Directive inadvertently created significant barriers to cross-border trade that now need to be corrected[260]. "Similar attempts at providing reassuring frameworks failed in past with legislation on esignature. This has not been a European phenomenon only: the world over, regulators that enacted laws promoting the use of digital signatures have found that private parties have continued to resist adopting them for commercial transactions"[261].

- *Cloud services:* The benefits are clearly recognised: "[C]loud computing is an economic and ecological tool that improves the IT performance of public and private concerns, cuts processing costs and limits storage costs, all of which are clearly benefits …" Concerns remain about security, reliability, robustness, data protection, jurisdiction, lack of standardisation, data ownership, intellectual property rights, and differences in national policy.[262] Commission initiatives in this area[263] are too new to have had much effect as yet.

- *The European Interoperability Framework (EIF):* The European Interoperability Framework (EIF) and the sTESTA network are part of a long succession of programmes to facilitate cross-border interoperability among e-government services. In principle, the approach makes excellent sense, and a few e-government services avail themselves of these architectures and capabilities. They seem to have had only limited effect to date – most services are still implemented at Member State level, with little regard paid to cross-border interoperability or software re-use.

- *Large Scale Pilots (LSPs) under the Competitiveness and Innovation Programme (CIP):* The LSPs probably represent a valuable channel for joining up efforts across the Member States; however, LSPs are pilot programmes that do not necessarily lead to coordinated operational deployments, although their goals is eventually to be taken up by the market, and their efficacy in addressing the market failures they are destined to address remains to be assessed.

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[260] Economisti Associati, 2012, p. 23: "The Directive has also scarcely contributed to break down the national market barriers it was originally aimed for. Member States and sometimes local governments or even public enterprises have continued to actively promote the adoption of their preferred technologies thereby fragmenting the market in a number of poorly interoperable solutions. The latter represent technical barriers both for the implementation of the e-service directive and for cross-border participation to e-procurement opportunities. Moreover, these solutions are now embedded in legacy systems with considerable sunk costs."

[261] Economisti Associati, 2012.

[262] European Parliament, 2011a.

[263] European Commission (2012m) 'Unleashing the Potential of Cloud Computing in Europe', COM(2012) 529 final.

- *Connecting Europe Facility (CEF):* The likely massive cuts in the proposed CEF funding eliminate the primary vehicle by means of which most of these intiatives otherwise might have been funded.

Why is this so hard? Perhaps the Parliament itself already provided the answer when it stressed "…that the barriers to eGovernment adoption are not necessarily only technological, but also organisational, political, legal and cultural, and that successful solutions and practices are usually highly dependent on local conditions …"[264].

6.2. European strengths, weaknesses, opportunities and threats

The opportunity to use these digital single market, cloud, big data, and ubiquity capabilities to promote both e-government and commercial applications are expanding rapidly just now due to the convergence of a number of factors. Notably, (1) many of the underlying software technologies are now ripe, especially including cloud computing and big data, and (2) continued price/performance improvements due to Moore's Law effects make widespread deployment cost-effective[265].

The opportunities and risks that these developments represent for Europe can best be visualised using a tool known as *SWOT* analysis (for *Strengths, Weaknesses, Opportunities, and Threats*). How could Europe benefit from widespread, integrated use of cloud, big data, and ubiquity in the implementation of e-government and commercial services? How might Europe be hurt?

The *Strengths* and *Opportunities* are positive, while the *Weaknesses* and *Threats* are negative. In this analysis, the *Strengths* and *Weaknesses* are internal, and represent the *inputs* that Europe can bring to bear in seeking to achieve a widespread and integrated use of cloud, big data, and ubiquity in the implementation of e-government and commercial services. The *Opportunities* and *Threats* are external, in the sense that they represent the potential outputs of the process, the potential gains and losses that Europe could experience.

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[264] European Parliament, 2011a.

[265] A factor of two price/performance improvement in computing power every eighteen months that was first identified by Gordon Moore of Intel.

Table 21:   SWOT analysis of Europe standing before an opportunity of achieving widespread and integrated use of cloud, big data, and ubiquity in the implementation of e-government and commercial services

	Helpful	Harmful
Inputs	**Strengths** • Size of the EU economy. • Economic and cultural diversity of the EU. • A large and highly educated, adaptable workforce. • Increasing speed and capability of devices and services, enhanced price performance (Moore's Law). • Emergence of big data, cloud services. • Willingness on the part of some governments to do innovative things.	**Weaknesses** • Inertia, resistance to process change, lack of willingness on the part of some public agencies.Lack of awareness of what can be done with these new technologies. • Fragmentation of Europe into Member States with different traditions leading to different approaches to government services. • Lack of leadership at EU level. • Administrative, legal and linguistic fragmentation. • A range of programmatic challenges in implementing integrated, coordinated and interoperable solutions across Europe. (e.g. lack of awareness). • Austerity measures and budgetary cuts that undermine planned reforms. • Lack of EU Global Private and Public Champions
Outputs	**Opportunities** • Greater governmental transparency and consumer empowerment. • Scale economies and software re-use for e-government services. • Lower unit costs. • Lower transaction costs. • Enhanced data interchange between governments. • Enhanced freedom of movement of goods, capital, services, and people. • Smarter regulation and administration; reduction of administrative burden for enterprises and governments. • Improved quality of life. • More transparency in labour and in goods and services markets. • Enhanced innovation.	**Threats** • Privacy and security risks and breaches. • Risks of lock-in. • Risk of access and service monopolisation. • Legal consistency of international data transfers and of contractual terms of services based in foreign jurisdictions.

A few words of explanation may be helpful here. The maturity of the technology, and the lower underlying cost of hardware and software, are what make it technologically and economically feasible to deploy ubiquitous services based for instance on cloud technologies. In this sense, they are inputs, enablers, or strengths.

The costs of deploying e-government services using integrated approaches based on these technologies can also represent lower socio-economic unit costs, not only due to the enhanced price/performance of the underlying components (which presumably would have

happened anyway), but also due to (1) the increased flexibility, manageability, and other advantages of distributed computing associated with the use of cloud services, in addition to (2) the economies of scope and scale that could potentially flow from software re-use and the implementation of solutions that are, as much as they can be, consistent across Europe. These are two distinct *outputs* from the process (one from the use of cloud and ubiquitous services, the other from improved integration), and in that sense they are *Opportunities*.

We emphasise that a Europe with many different traditions has many different implications. Overall, Europe's diversity is a strength. In terms of implementing consistent ICT e-government solutions across Europe, however, different approaches can be an impediment, and thus a *Weakness* in the context of the SWOT.

Finally, we note that the weakness 'range of programmatic challenges in implementing integrated, coordinated and interoperable solutions across Europe' is a reflection of the fact that all of the efforts to achieve fully interoperable e-government in Europe seem either to face serious challenges, or else to be too early in implementation to judge (see Section 6.1.5).

6.3. The problem to be solved

The Problem Definition follows directly from the SWOT analysis. Implementation of e-government services does not benefit to the degree that it could from software re-use and scale economies that are potentially achievable because Member State governments do not sufficiently benefit from examples of best practice in other Member States. There is insufficient awareness in some Member States of what new technologies, and their corresponding price/performance advantages, enable in regard to the delivery of e-government services.

This is to some extent a natural consequence of the Union being comprised of 28 Member States. *Implementation of e-government services cannot be identical unless the services themselves are identical*; however, there could be still be synergies that do not appear to be fully realised today.

As already noted, it has long been recognised that Member States public administrations could potentially benefit from a common underlying approach to e-government services that would enable efficient, effective e-government services, including cross-border interoperability, and that such services could in turn help citizens and businesses to profit fully from the EU's Single Market; however, the level of integration and commonality of e-government services in Europe today appears, based on our findings, to still offer a great deal of room for improvement.

As we have seen, there is no lack of programmatic responses; however, in one way or another, the programmatic responses have so far failed to achieve the desired effect (see Section 6.1.5). The emergence of new technologies, notably cloud services and big data, seem to offer the opportunity to return to these long-standing concerns with new enthusiasm and also with a new toolkit.

6.4. Indicators of effectiveness and efficiency

In analysing the various initiatives in this report, we have used a generally consistent set of metrics or indicators throughout – not only in the Impact Assessment portion of the analysis, but also in the detailed assessments of case studies, which in turn flows into our assessment as to which sectors or areas are potentially most amenable to coordination at European level.

A number of these metrics have a commonly understood meaning in European policymaking, but it is worth spending a moment on all of them, since each has particular facets that are specific to the problem at hand.

- *Effectiveness:* The degree to which something achieves the desired objectives. In the case of a particular e-government service, the degree to which it is taken up is clearly a key determinant.

    - Effects of product/service/application/solutions on businesses and governmental authorities

    - Effects of product/service/application/solutions on the demand side (private/business users).

    - Potential macro effects.

- *Efficiency:* The degree to which something achieves the desired objectives with minimal expenditure of resources.

    - Communication vis-a-vis the envisaged stakeholders.

    - Costs (financial and other).

    - Approaches to avoid gaps/duplications/inconsistencies.

    - Interrelationship between planning and implementation, optimal steering.

- *Coherence:* The degree to which something is consistent with European policy. In the context of e-government services, which are sometimes implemented at local or municipal level, consistent of local projects with Member State policy may also be an issue (but not necessarily relevant at European level).

    - Degree of embeddedness into the wider policy context.

    - Accommodation of national, regional and local preferences.

    - Promotion of the free movement of goods, capital, services and people.

6.5. Objectives for European policy

At European level, key objectives for a European intervention might include:

- Ensuring that existing policy instruments are effective (see Section 6.1.5);

- Joining up e-government implementations so as to achieve realistically realisable economies of scope and scale;

- Facilitation of data interchange among e-government applications so as to enable cross border interchange of information where appropriate (and with due respect to individual privacy);

- Coordinating research and standardisation policy so as to avoid needless duplication and waste;

- Achieving unfragmented operation of the Digital Single Market.

Making existing policy instruments effective likely entails different actions for different policy instruments. In some cases, it may entail ensuring adequate funding (the reduction in CEF funding notwithstanding). In others, it may involve better management and monitoring. In still others, the underlying action lines may require significant re-thinking. Often, a combination of corrections will be needed. We anticipate that the mid-term review of the Digital Agenda for Europe will provide useful feedback as to the steps that are likely to be required.

The principles of subsidiarity and proportionality always play a key role in European policymaking, but subsidiarity is especially salient as regards e-government. In general, e-government cannot enjoy a greater degree of commonality across Member States than the underlying government activities that it implements. This implies that for most applications, a 'one size fits all' solution is unlikely to be appropriate; however, there is still considerable scope for action at European level. European initiatives to enhance the cross border interoperability of e-government services, or to improve their efficiency or to encourage the use of more modern and user-friendly technology, offer obvious benefits and are not *per se* incompatible with the principle of subsidiarity.

7. AREAS AMENABLE TO COORDINATION

KEY FINDINGS

- The various ostensibly ubiquitous systems that we studied differ from one another along at least three primary dimensions: (1) technology, (2) centralisation versus decentralisation, and (3) interoperability (both within countries and, for the EU, among countries).

- A recurrent theme throughout this report is centralisation versus decentralisation. What is the optimal structure for ubiquitous applications, especially those created by governments, within the confederated system that already exists at EU level?

- In light of Europe's inherent fragmentation, fully achieving interoperability and economies of scale and scope across the entire EU *is an order of magnitude more complex than in any of the individual countries or Member States that we studied*. At the same time, unfragmented operation of the Internal Market constitutes an essential objective of the European Union.

- There might be a temptation to confuse centralisation with interoperability, but the systems that we studied demonstrate that they are not necessarily the same thing. A system with a centralised and monolithic implementation is likely to be interoperable across the space that it covers, but it does not necessarily follow that all interoperable systems must be centralised. A decentralised group of implementations can also be interoperable if they all adhere to the same standard protocols and interfaces (such as, for example, the Dutch system for interchange of health records).

- We have identified a number of areas that appear to deserve particular attention regarding EU level coordination: identification (e-ID), authentication, and authorisation schemes; the European Interoperability Framework (EIF) and related activities; eHealth, including (1) exchange of patient data and (2) ePharmacy; e-VAT; and e-Customs.

- Citizens have further indicated that they see the need for cross-border services in the field of the job market, such as pensions portability and job postings.

- Examining progress (or lack of it) to date in each of these areas is instructive.

- In eHealth, for instance, there has been an *epSOS* CIP Large Scale Pilot Programme in place since 2008, which has developed a great deal of theoretical and practical information about the challenges to the exchange of patient data and to cross-border ePharmacy. epSOS demonstrates that cross-border interoperability of eHealth systems could, in principle, be achieved.

- Experience with epSOS also tends to confirm that cross-border interoperability of eHealth systems in Europe will have to address serious challenges at (1) the technological and semantic level, (2) the organisational level, and (3) the legal level.

- Experience to date illustrates that *implementation of ubiquitous eHealth applications is neither hopeless nor easy*. Despite continued initiatives at European level, widespread implementation of cross-border eHealth services at the present plodding pace could easily be a decade away.

- We recommend that the already committed deliverables of the Commission and the eHealth Network for 2014 and 2015 in regard to cross-border eHealth systems be expanded to include concrete planning with specific dates and commitments to operational systems (subject to funding by the European institutions).

- The Interoperability Solutions for European Public Administrations (ISA) programme promotes the European Interoperability Framework (EIF) in order to foster cross-cutting interoperability among e-government applications. It is a follow-on to the IDABC programme that was launched in 2004. The broad objectives seem to us to be appropriate, and to address real needs regarding cross-border e-government interoperability. This programme appears to promote wide-ranging and useful discourse, but we find little evidence of operational accomplishments or of a sense of urgency.

- The potential benefits of e-VAT are clear in terms of cost reduction, uniform treatment of large and small enterprises, and facilitating harmonised cross-border operations throughout the Single Market. Nonetheless, past experience has shown that the cost and operational efficiencies made possible by the implementation of e-VAT systems are limited by differing Member State capabilities to implement IT-based solutions in the remaining areas of cross-border digitalisation, such as VAT refunds.

- E-customs also potentially offers clear benefits in terms of operational economies of scale, a level playing field among large enterprises and small, and reduced opportunities for arbitrage between the Member States, thus enhancing the effectiveness of the Single Market.

- Other policy areas pursued on the European level would merit from a close examination of benefits that could be derived from ubiquitous solutions since such solutions require and lead to better coordination of e-government services, as well as to an improved and unfragmented access to them. This is reflected in expectations of EU citizens and businesses in such areas as emergency services, employment, vocational training and education, public procurement, registers, etc. A detailed analysis of costs and benefits needs to be performed on a case by case basis.

This chapter aims at summarising the findings of the research on ubiquitous policies, projects and services in the respective countries and at distilling potential areas of public intervention on the European level. To this end, we focus on examples from the countries that seem to mirror a 'successful' approach – from the perspective of implementation and/or utilisation - towards the development of an overall ubiquitous market.

7.1. Ubiquity, cross-border interoperability, centralisation, or common implementation?

The various ostensibly ubiquitous systems that we studied differ from one another along at least three primary dimensions:

- Technology;

- Centralisation versus decentralisation; and

- Interoperability (both within countries and, for the EU, among countries).

As regards technology, some of the systems that we studied were cloud-based, while others were not. Some were accessible in many different ways, both fixed and mobile, while others were not.

A recurrent theme throughout this report is centralisation versus decentralisation. It is also a recurrent theme in the literature of political science and public administration, but there is no single answer that is uniquely preferred; no 'dominant strategy'. Different political systems have evolved in different ways, each with its own advantages and disadvantages. Centralised systems offer scale economies and the benefits of centralised planning, but the economic collapse of the USSR is one example that may demonstrate the limits of that approach. Decentralised systems may be more flexible, may offer more scope for experimentation, and may be better able to accommodate legitimate local preferences. History offers numerous examples of the shortcomings of this approach as well, such as the United States under the Articles Confederation (1783-1793) where the economic transaction costs of achieving common policy among the thirteen independent states rapidly led to a rejection of the arrangement.

The question before us in this report is not the centralisation or decentralisation of the European Union, but rather the optimal structure for ubiquitous applications, especially those created by governments, within the confederated system that already exists at EU level.

There might be a temptation to confuse centralisation with interoperability, but the systems that we studied demonstrate that they are not necessarily the same thing. A system with a centralised and monolithic implementation is likely to be interoperable across the space that it covers, but it does not necessarily follow that all interoperable systems must be centralised. A decentralised group of implementations can also be interoperable if they all adhere to the same standard protocols and interfaces (such as, for example, the Dutch system for interchange of health records).

Language and culture are intertwined with political structure in complicated ways in this discussion. In the course of our study, we have identified numerous solutions that were comprehensively implemented at *national* level. A country like South Korea or Japan is more nearly comparable in size to a single large EU Member State than to the EU as a whole; moreover, each of the countries that we studied enjoys for the most part a single language[266] and a single culture. Comparing the EU as a whole even to the United States is not altogether appropriate, even though they might seem to be somewhat comparable in population and land mass, because the US is a *single federal political entity with essentially one language and one culture*.

In other words, fully achieving interoperability and economies of scale and scope across the entire EU *is an order of magnitude more complex than in any of the individual countries or Member States that we studied*. At the same time, unfragmented operation of the Internal Market constitutes an essential objective of the European Union.

On the technology side, some of the choices are neutral in terms of services offered to the user, while others are not. Ubiquity (in the sense of the ability to access the services from anywhere, at any time, and by any reasonable means) is user-visible, and has clear benefits to the user and to society. In the past, the technology might have imposed daunting costs on the provision of services that are ubiquitous in this sense; today, however, there seems to be little if any additional cost in implementing services that are ubiquitous.

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[266] In the case of Canada, two languages and to some extent two cultures.

The technological argument quickly becomes more complex when we speak of capabilities that are often associated with ubiquity, including the use of cloud services. Cloud is, for the most part, a price/performance trade-off for the implementing agency. Cloud services do not necessarily offer different functionality than non-cloud services. There is a strong argument to be made that European policy in regard to the implementation of e-government services should not be seeking to pick winners and losers here, but rather should leave the cost-benefits analysis up to the procuring agency[267].

Public cloud services appear to be able to offer substantial scale and scope economies, as well as reliability and robstness thanks to the extensive use of redundancy. Against these benefits must be measured for instance (1) possible exposure of consumer private information to commercial parties that provide the cloud services[268]; (2) possible exposure of consumer private information to government that have some connection with the cloud services[269]; (3) possible security exposures that are not under the control of the procuring agency; (4) uncertainty as to who owns the data in the data repository, and (5) possible lock-in to a single vendor of cloud services (with the concomitant risk of the vendor going bankrupt some day). As we have seen, similar considerations led the Netherlands to decide to refrain from the use of public cloud services.

Private clouds (as in Estonia) mitigate many of the risks of public cloud services, but sacrifice some of the key advantages (including scale economies, and out-sourced management).

7.2. Identification of areas that are most susceptible to benefit from EU level coordination

Based primarily on the findings provided in summary form in the tables in Annex 1, we have identified a number of areas that appear to deserve particular attention regarding EU level coordination because they might contribute toward the development of a ubiquitous Single Market. These areas rest in particular on a characteristic interrelationship of service and application attributes on the one hand, and on underlying infrastructural features on the other hand. Promising areas for action seem to be:

- *Identification (e-ID), authorisation and authentication schemes*: A trusted European Federated eID system might in particular contribute towards the development of a ubiquitous Single Market, because electronic identification and authentication are in most cases a precondition for cross-border communication (see Section 7.2.1). National examples are e-ID in Estonia and 'Federating Identity' for Canada. Such approaches are likely to contribute strongly and effectively to the further development of secure electronic or ubiquitous services. Moreover, they bear a high potential of building trust and acceptance in digitalised services at large.

- *The European Interoperability Framework (EIF) and related activities*: As with e-ID, authorisation and authentication, the EIF could provide crucial, common enabling infrastructure for multiple e-government applications. Through common interfaces and application semantics, it could facilitate vitally needed cross-border interoperability.

- *eHealth, ePharmacy, and the exchange of electronic patient records:* Electronic patient records such as those implemented in Estonia, Canada and the the

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[267] Whatever merit there might be in cloud services as a direction for *research funding* is a different analysis.

[268] Consider for instance the implications of the use of Facebook authentication.

[269] Consider the concerns of physicians in the Netherlands that construction of a national health care records by a US firm could enable the US government to use the Patriot Act to access private patient data.

Netherlands offer the opportunity to access health records from anywhere at any time. However, medical data are strongly linked to privacy issues (see Section 7.2.2)[270].

- *e-VAT*: The potential benefits of e-VAT are thus clear, in terms of cost reduction, uniform treatment of large and small enterprises, and facilitating harmonised cross-border operations throughout the Single Market (see Section 7.2.3.).

- *e-Customs*: Differences in the handling of customs procedures can distort patterns of trade across the customs union in terms of access to markets by non-EU economic operators, thus jeopardising the development of the Single Market. The electronic customs project initiated by the European Commission in 1997 aims to place customs procedures on an EU-wide electronic basis with the goals of enhancing security at the EU's external borders and of facilitating trade (see Section 7.2.3.3).

Subsidiarity is relevant to all of these areas, but there is a reasonably clear justification for action at European level, and some actions are indeed already being taken or attempted with varying degrees of success.

For each of these areas amenable to European coordination, we consider possible ways forward at European level in Sections 7.2.1, 7.2.2, and 7.2.3, respectively.

Furthermore, other policy areas pursued on the European level would merit from a close examination of benefits that could be derived from ubiquitous solutions since such solutions require and lead to better coordination of e-government services, as well as to an improved and unfragmented access to them. This is reflected in expectations of EU citizens and businesses in such areas as emergency services, employment, vocational training and education, public procurement, registers, etc. A detailed analysis of costs and benefits needs to be performed on a case by case basis.

7.2.1.   Identification and authentication schemes

(Electronic) identification and authentication schemes are fundamental building blocks for a wide range of ubiquitous systems. Governments, businesses and citizens interact increasingly online and most interactions (be it e-Banking, e-Commerce or e-Government) require some form of online credentialing to identify and authenticate users. This was also a significant theme in a recent study for the European Parliament, which provides both an optimistic assessment of the potential for e-ID and a somewhat pessimistic but in our view well-reasoned assessment of challenges to its success[271].

Currently, the lack of cross-border interoperability of national electronic identification solutions prevent European citizens and businesses from accessing online services in other Member States and, hence, hinder their ability to fully benefit from the digital single market[272]. An e-ID solution at the European level which would allow for the mutual recognition of e-IDs across Member States would enable cross-border service provision. However, when developing a European Federated e-ID system, challenges in the area of data protection, privacy, trust, interoperability and a legal framework providing legal certainty come into play. To address some of these issues, the Pilot A STORK develops an

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[270] See, for instance, the ruling of the Dutch Data Protection Authority CBP (2013) 'Zorginstellingen onzorgvuldig met medische gegevens', 18 June, http://www.cbpweb.nl/Pages/pb_20130618_rapport-patientendossiers-binnen-zorginstellingen.aspx.

[271] Economisti Associati, 2012.

[272] European Commission (2011f) 'Towards a Trusted and Sustainable European Federated eID system. Final Report, 15 September, https://ec.europa.eu/digital-agenda/sites/digital.../smart2010-0068.pdf.

interoperability framework between national e-ID systems that was tested in six cross-border pilot projects[273].

E-Signature and e-ID were the digital single market priorities of the Single Market Act, a key action in the Digital Agenda for Europe and was reiterated as a proposal to be fast-tracked in the recent roadmap. Proposed legislation has a twofold rationale. It can be first justified by the need to remove the technical barriers to trade that the previous Directive on e-Signature had inadvertently created and that are now particularly notable in the e-Procurement sector and in access to e-Government for the service industry. Additionally, there would be a demand for national e-ID services as a way to remedy the alleged market failure of consortia-led standardisation in the private industry. Indeed, the lack of a reliable authentication and identity management system on the Internet has so far resulted in constraints to wider public acceptance of e-Commerce.

Similar attempts at providing reassuring frameworks failed in past with legislation on e-signature. This has not been a European phenomenon only: the world over, regulators that enacted laws promoting the use of digital signatures have found that private parties have continued to resist adopting them for commercial transactions. The prevailing standard in retail e-commerce is still represented by a combination of a relatively simple technological fix such as the SSL internet protocol, very basic identification systems based on user-id and passwords, and verification services provided by the banking system[274].

A recent study for the European Parliament found e-Identification to enable a market of EUR 15 to 30 billion, and to enable a price-efficiency related consumer surplus of EUR 0.5 to 1.5 billion[275]. At the same time, that study injects a note of caution: "[T]he success of actions on e-identification and authentication, re-use of public sector information and, possibly in the future, e-payments also depends on effective ICT standardisation and involvement of the ICT industry in standardisation work for European public purposes"[276].

Another study, performing an impact assessment of the e-Identity measures undertaken at the European level, found that ceasing all activities in this field would not be a viable option as it is unlikely that a level playing field would be created. Rather, they considered options such as "creating regulation on cross-border recognition of formal e-ID systems", or "legislation to ensure recognition of some or all of the STORK QAA [authentication] levels, using the QAA levels as one interoperability criterion for the infrastructure" to be possibly effective, and recommendedpursuing these lines of actions[277].

In their development of a European Federated eID system, the European Commission could learn from several examples, such as e-ID in Estonia and the 'Federating Identity' for Canada. Such approaches bear a high potential of building trust and acceptance in digitalised services at large. A trusted and accepted European eID system could facilitate the development and accessing of cross-border services both in the public and the private sector and thus could stimulate a truly European online market.

7.2.2.   e-Health and the exchange of patient health records

In Section 7.2, we identified eHealth as one of the most promising areas for concerted action at European level. We have delved deeply into eHealth, partly for this reason, but also because it provides an illuminating case study.

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[273] Leitold, H. (2011) 'Challenges of e-ID Interoperability: The STORK project', In: Fischer-Hübner, S. et al. (Eds.): Privacy and Identity2012, IFIP AICT 352, pp. 144-150.

[274] Economisti Associati, 2012.

[275] Economisti Associati, 2012, Table 2.

[276] Economisti Associati, 2012.

[277] Intrasoft International & TNO (2012) 'Study on Impact Assessment for legislation on mutual recognition and acceptance of e-Identication and e-Authentication across borders SMART 2011/0075 IAV, final report', http://ec.europa.eu/digital-agenda/en/news/study-impact-assessment-legislation-mutual-recognition-and-acceptance-e-identification-and-e.

The challenges in implementing ubiquitous, fully integrated and interoperable eHealth systems at European level have very little to do with the technology of individual deployments; rather, they have a great deal to do with diversity in the underlying health care systems, inconsistencies in the semantics of underlying data, and the need to ensure the privacy, integrity and security of sensitive individual health data.

At the same time, it is important to bear in mind that e-Health is not a single application, but rather a complex constellation of interrelated activities. In various sections of this report, we have reviewed a number of e-Health initiatives, including solutions for e-pharmacy, home care, and exchange of health records.

Achieving integrated and/or interoperable solutions at European level is not easy for any of these systems. Our national case studies are not encouraging. Even the advanced ubiquitous systems in Estonia, for example, do not permit ePharmacy orders to be placed from another Member State. The Netherlands found it impractical to implement fully coordinated systems even at national level, to say nothing of European level! Moreover, they encountered significant implementation delays due to concerns about the privacy of sensitive health data due to the use of a U.S.-based contractor.

We consider the automated *exchange of health records* to represent particularly promising and fertile ground. Another promising areas is the fulfilment of prescriptions issued in one Member to an individual whose domicile (and health care coverage) are in another Member State. These areas are promising, but both pose numerous complexity and implementation challenges.

In understanding the challenges posed, and potential means of addressing them, it is necessary to focus on multiple relevant instruments:

- The *Data Protection Directive*, Directive 95/46/EC[278];

- The *Smart Open Services for European Patients (epSOS)* from the CIP;

- The Commission Recommendation on cross-border interoperability of electronic health records (EHRs)[279];

- The Directive on the application of patients' rights in cross-border healthcare[280];

- The eHealth Network; and

- The Commission's Communication on the eHealth Action Plan 2012-2020[281].

These are described in turn in Sections 0 through 0. A great many additional instruments could be considered as well, but will be omitted in the interest of brevity[282].

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[278] European Parliament & European Council (1995) 'Directive 95/46/EC of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data'.

[279] European Commission (2008) 'Recommendation of 2 July 2008 on cross-border interoperability of electronic health record systems', 2008/594/EC.

[280] European Parliament & European Council (2011a) 'Directive 2011/24/EU of 9 March 2011 on the application of patients' rights in cross-border healthcare'.

[281] European Commission (2012d) 'eHealth Action Plan 2012-2020 - Innovative healthcare for the 21st century', COM(2012) 736 final, {SWD(2012) 413 final}, {SWD(2012) 414 final}.

[282] Among these are the e-Privacy Directive (European Parliament & European Council (2002) 'Directive 2002/58/EC of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (Directive on privacy and electronic communications)'; the Medical Devices Directive(s) (see: European Commission (2012i) 'Safe, effective and innovative medical devices and in vitro diagnostic medical devices for the benefit of patients, consumers and healthcare professional', COM(2012) 540 final); European Commission (2012h) 'Proposal for a Regulation of the European Parliament and of the Council on medical devices, and amending Directive 2001/83/EC, Regulation (EC) No 178/2002; Regulation (EC) No 1223/2009', 2012/0266 (COD); European Commission (2012g) 'Impact Assessment Accompanying the document 'Regulation of the European Parliament and of the Council on the protection of individuals with regard

Directive 95/46/EC

Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 represents the basic European framework on the protection of individuals with regard to the processing of personal data and on the free movement of such data. A range of instruments effectively complement the Data Privacy Directive, including the Article 29 Working Party document on the processing of personal data relating to health in electronic health records (WP 131), and Council of Europe Recommendation no (97)5[283].

Article 8 of Directive 95/46/EC explicitly recognises the highly sensitive nature of health care data. It explicitly prohibits "the processing of data concerning health or sex life" except where "the data subject has given his explicit consent to the processing of those data".

An explict carve-out permits access to health records for emergency care where "processing is necessary to protect the vital interests of the data subject or of another person where the data subject is physically or legally incapable of giving his consent".

Another exception permits use for public health purposes "where processing of the data is required for the purposes of preventive medicine, medical diagnosis, the provision of care or treatment or the management of health-care services, and where those data are processed by a health professional subject under national law or rules established by national competent bodies to the obligation of professional secrecy or by another person also subject to an equivalent obligation of secrecy."

Article 8(4) enables Member States for reasons of substantial public interest to lay down additional exemptions to the prohibition on the processing on health data (subject to the provision of suitable safeguards) either by national law or by decision of the supervisory authority.

Directive 95/46/EC appears to be sensible, and does not in and of itself pose barriers to the transfer of sensitive health information across national borders; however, because it does not specifically anticipate such transfer of health data, the transposition of Directive 95/46/EC into national law often inadvertently erects barriers to the transfer of data to other Member States or to third countries, as we shall see in Section 0.

The epSOS Large Scale Pilot programme under the CIP

As noted, the automated exchange of health records, together with the fulfilment of prescriptions issued in one Member to an individual whose domicile (and health care coverage) are in another Member State, appear to us to represent particularly promising and fertile ground.

Fortunately, there is a base of experience in the form of a 'Pilot A' programme from the *Competitiveness and Innovation Programme (CIP)*: *Smart Open Services for European Patients (epSOS)*. epSOS is a large scale Europe-wide project organised by dozens of beneficiaries including ministries of health, national competence centres, and numerous companies. The overarching goal of epSOS was to develop a practical e-Health framework

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to the processing of personal data and on the free movement of such data' (General Data Protection Regulation) and Directive of the European Parliament and of the Council 'on the protection of individuals with regard to the processing of personal data by competent authorities for the purposes of prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and the free movement of such data' SEC(2012) 72 final; Article 129 Data Protection Working Party (2007) 'Working Document on the processing of personal data relating to health in electronic health records', 00323/07/EN, WP 131, http://ec.europa.eu/justice/policies/privacy/docs/wpdocs/2007/wp131_en.pdf.

[283] For a comprehensive list of relevant legislation and declarations, see epSOS (2009), 'Annex A (List of relevant European legislation, International Conventions and Declarations), D2.1. Legal and Regulatory Constraints on epSOS Design – Participating Member States: T2.1.1. Analysis and Comparison', 17 February.

and a prototype ICT infrastructure to enable secure access to patient health information, particularly with respect to basic patient summaries and e-Prescriptions between different European healthcare systems.

Participation includes not only multiple EU Member States, but also non-EU members Norway, Switzerland, and Turkey.

The initial focus of epSOS was on potential two pan-European services, both of which are directly relevant to our study: (1) the electronic Patient Summary and (2) ePrescription.

In regard to the Patient Summary, two use cases have been studied:

- An occasional visitor, for example someone on holiday or attending a business meeting. The distinguishing characteristic is that this type of visit is irregular, infrequent, and may not be repeated. This is a type of incidental encounter where the healthcare professional may have no previous record of the person seeking care.

- A routine case, for example someone who lives in one country but works in another. The distinguishing characteristic is that this type of visit is regular, frequent, and the person seeking care may be accustomed to using services in the country where he or she works as a matter of personal convenience. This is a type of occasional situation where the healthcare professional may have some information available from previous encounters.

In regard to the ePrescriptions, two further use cases have been studied:

- A patient needs medicine that is already prescribed in his or her home country while in another country. In this case, the pharmacist should be able to electronically access the prescription from the same e-Health interface he or she uses for prescriptions ordered in the local country. When medicine is dispatched, the system should notify the home country node of the foreign patient about the dispensed drugs.

- A medical professional decides to prescribe medicine to a visiting patient from another country. To assist the medical professional to make the best decision on the pharmaceutical strategy to be used, the patient's medical and pharmaceutical history from her home country should be available through the Patient Summary. (Note that this implies a linkage between the two Patient Summary and the ePharmacy applications.) When the electronic prescription has been finalised, a copy of the prescription should be sent to the patient's national node for inclusion in the national medication summary.

Before proceeding, it is perhaps helpful to define key vocabulary:

- *Country A* is the Member State of affiliation, i.e. the Member State where personal health data is stored and where the mobile patient is insured. This is the country where the patient can be univocally identified and where his data can be accessed.

- *Country B* is the Member State of treatment, i.e. the Member State where cross-border healthcare is actually provided when the patient is seeking care abroad. This is a country, different from country A, in which information about a patient is needed in case the patient needs healthcare.

- *ePrescription* means a prescription for medicines or treatments, provided in electronic format. A prescription is understood as a set of data such as drug ID, drug name, strength, form, dosage, indication.

- *Health Care Professional (HCP)* is a person professionally qualified to deliver care.

Early on, epSOS concluded that potential legal and regulatory challenges fell in four categories:

- *Data Protection and Confidentiality:* Given the general applicabilitiy of the Directive 95/46/EC, the focus of epSOS was on understanding how it was applied in the different Member States.

- *Different health-related standards among Member States:* In the case of medication dispensed based on ePrescriptions, for instance, it was necessary to address questions of delivery of drugs from one country to another, and delivery of drugs in a drugstore in country B which according to the national law of country A are restricted to pharmacies. For ePharmacy, many of these issues were later dealt with in the 2011 Directive on the application of patients' rights in cross-border healthcare.

- *Professional accreditation and prerogatives:* There has long been a requirement for Member States to recognise accredited HCPs (including doctors of medecine, dentists, nurses, pharmacists, and midwives) from other Member States[284]; however, this has not uniformly been transposed into the ability to access health care records. In some Member States, for example, nurses are not allowed to access patients' data, while in others nurses provide supervised care traditionally provided by doctors. In the list of authorised HCPs in the Czech Republic, as another example, an epSOS case study noted that no provision had been made for HCPs accredited in other Member States to access the health records of Czech citizens[285].

- *Liability (work protocols, traceability and auditability):* Cross-border provision of medical services raises new risks and potential legal liability when a practitioner in country B is to base critical decisions on patient health information produced within an unfamiliar system of care. How far can the data received from Country A be regarded as trustworthy by professionals in Country B? How can it be guaranteed that patient data transferred is correct, valid and current? Who takes responsibility when problems arise because the clinician in Country B relied upon inaccurate data coming from Country A? This risk also exists within each Member State, but the 'distance' between the countries, including differences of language and culture, can amplify it. A similar problem relates to the updating of a patient's record when an HCP in Country B sends information to country A (e.g. to indicate that a prescription has been dispensed).

Our perception is that the epSOS Large Scale Pilot has been an extremely useful exercise; nonetheless, we see little to suggest that the results will be translated into large scale European practice in the absence of further explicit policy interventions at European level. This is not a specific epSOS problem, but reflects a more general concern across the Competitiveness and Innovation Programme (CIP) as a whole.

As part of the formal evaluation of the CIP as a whole, the expert panel noted that Large Scale Pilots (Pilot A projects) "… address large-scale economic, social and societal issues and are largely designed by the European Commission services themselves. They involve a large number of European stakeholders essential to design the cross-border services and set up the necessary institutional, regulatory and interoperability/standardisation frameworks. Most Pilot As have been successful in demonstrating the viability of services, in

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[284] European Parliament & European Council (2005a) 'Directive 2005/36/EC of 7 September 2005 on the recognition of professional qualifications', http://ec.europa.eu/internal_market/qualifications/policy_developments/legislation/index_en.htm.

[285] epSOS, 2009, pp. 29-30.

promoting regulation and standardisation, and the first stage in establishing cross-border infrastructures. Nevertheless, there are questions related to their sustainability and to funding the service platforms that are essential to the operation of the service. In many cases it is clear that involvement of end-users is still needed and that development of large transaction volumes is both critical and difficult. … Evidence so far indicates that the Pilot As contribute to the standardisation process and identify areas where new regulation or legislation is required. *Although the subject areas of Pilot As are important for developing the single digital market, they raise questions as to why there has been relatively little expressed demand for innovative cross-border solutions in these areas and the extent of systemic and organisational failures in meeting such demand. In some sectors, such as health care, there is a multitude of standards and precautionary legislation within countries that inhibits cross-border service delivery.* [emphasis added] In such cases, Pilot As can be useful in promoting single cross-border standards. However, at the time of preparing the expert panel report there is little evidence that building infrastructure of this kind is directly stimulating cross-border transactions, emphasising the need for well planned and concerted efforts to raise awareness and expand user involvement in developing and testing the new services. As the Pilot A subject areas have been chosen to develop innovative new cross-border services and interoperable service platforms that have so far been neglected by market participants, it is crucial to strengthen user uptake and widespread experimentation and use of these platforms, in particular to develop mechanisms to ensure cross-border interoperability in the most promising areas"[286].

The Commission Recommendation on cross-border interoperability of electronic health record systems

As a part of the 'i2010 initiative', the Commission's 2008 Recommendation on cross-border interoperability of electronic health record systems[287] would appear to represent an important pronouncement.

It rightly identifies the challenge, in our view: "Lack of interoperability of electronic health record systems is one of the major obstacles for realising the social and economic benefits of eHealth in the Community. Market fragmentation in eHealth is aggravated by the lack of technical and semantic interoperability. The health information and communication systems and standards currently used in Member States are often incompatible and do not facilitate access to vital information for provision of safe and good quality healthcare across different Member States."

The operative language of the Recommendation provides a reasonable assessment of the elements that would be needed, but it stops short of providing a concerted way forward. "Implementing interoperability of electronic health record systems will require a complex set of framework conditions, organisational structures and implementation procedures involving all relevant stakeholders. To achieve this, Member States are invited to undertake actions at five levels, namely the overall political, the organisational, the technical, the semantic and the level of education and awareness raising. It is essential to create an organisational framework and process that will enable cross-border interoperability of electronic health record systems. This should be based on a roadmap, developed by Member States, which covers a five-year period and provides details with regard to the following milestones: (a) agree on a European governance process to establish guidelines for developing, implementing and sustaining cross-border interoperability of electronic health record

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[286] Vickery, G., Luukkonen, T., Radosevic, S. & Fisher, R. (2011) 'CIP ICT PSP Second Interim Evaluation: Final report 3.0', 20 July, excerpts from the final report of the evaluation panel, http://ec.europa.eu/cip/files/cip/docs/cip_ict_psp_interim_evaluation_report_2011_en.pdf.

[287] Vickery et al., 2011.

systems covering management for reliable identification of patients and authentication of health professionals; (b) consider policies and incentives to increase demand for procuring eHealth services to enable interoperability of electronic health record systems; (c) analyse the factors which render the standardisation processes leading to higher levels of interoperability of electronic health record systems such a long, complex and expensive activity, and devise measures to speed up these processes."

Other than the epSOS Large Scale Pilot (LSP), the limitations of which were already noted in Section 0, we are hard pressed to identify any specific measures that have been taken at European level to give shape to such an approach.

It is fairly clear that the Member States cannot organise themselves without suitable structures to give the effort some shape at European level. There are now 28 Member States plus three EEA Members for a total of 31. Achieving interoperability throughout the EU and EEA by means of bilateral agreements would, by simple arithmetic, require on the order of 450 individual agreements[288]. It is reasonably clear that economic transaction costs prevent this from happening in the absence of a concerted European initiative.

The Directive on the application of patients' rights in cross-border healthcare

The Directive on the application of patients' rights in cross-border healthcare was enacted in 2011[289].

The Directive provides numerous important clarifications as regards ePharmacy. Article 11(1) provides, for instance, that "If a medicinal product is authorised to be marketed on their territory, Member States shall ensure that prescriptions issued for such a product in another Member State for a named patient can be dispensed on their territory in compliance with their national legislation in force, and that any restrictions on recognition of individual prescriptions are prohibited unless such restrictions are: (a) limited to what is necessary and proportionate to safeguard human health, and non-discriminatory; or (b) based on legitimate and justified doubts about the authenticity, content or comprehensibility of an individual prescription. The recognition of such prescriptions shall not affect national rules governing prescribing and dispensing, if those rules are compatible with Union law, including generic or other substitution."

The Directive also calls on the Commission to facilitate implementation by adopting "… measures enabling a health professional to verify the authenticity of the prescription and whether the prescription was issued in another Member State by a member of a regulated health profession who is legally entitled to do so through developing a non-exhaustive list of elements to be included in the prescriptions and which must be clearly identifiable in all prescription formats, including elements to facilitate, if needed, contact between the prescribing party and the dispensing party in order to contribute to a complete understanding of the treatment, in due respect of data protection."

This is a Directive, and thus depends on accurate transposition into national law; however, it seems to establish necessary and appropriate conditions for ePharmacy. A prescription written in another Member State is valid, provided it is not contrary to the rules in effect in the Member State of treatment. The HCP who wrote the prescription must have been authorised in the Member State where the prescription was written, not necessarily in the Member State where the prescription is dispensed.

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[288] It is the combination of 31 things taken two at a time (C(31,2)), which is equivalent to the sum of an arithmetic progression from 1 to 31.
[289] European Parliament & European Council, 2011a

The Directive also contains extremely important provisions regarding financial responsibility for cross-border health care. This is clearly crucial relative to the free movement of healthcare services. Articles 7 and 8 of the Directive require that "the Member State of affiliation … ensure the costs incurred by an insured person who receives cross-border healthcare are reimbursed, if the healthcare in question is among the benefits to which the insured person is entitled in the Member State of affiliation."

Relative to cross-border exchange of healthcare information, the Directive calls for a loose, cooperative approach between the Member States and the European Institutions. "Widely different and incompatible formats and standards are used for provision of healthcare using ICTs throughout the Union, creating both obstacles to this mode of cross-border healthcare provision and possible risks to health protection. It is therefore necessary for Member States to aim at interoperability of ICT systems. The deployment of health ICT systems, however, is entirely a national competence. This Directive therefore should recognise the importance of the work on interoperability and respect the division of competences by providing for the Commission and Member States to work together on developing measures which are not legally binding but provide additional tools that are available to Member States to facilitate greater interoperability of ICT systems in the healthcare field and to support patient access to eHealth applications, whenever Member States decide to introduce them"[290].

At the level of operative language, Article 14 of the Directive calls on the Commission to put in place the mechanisms necessary "for the establishment, management and transparent functioning" of an e-Health network. "The Union shall support and facilitate cooperation and the exchange of information among Member States working within a voluntary network connecting national authorities responsible for eHealth designated by the Member States. The objectives of the eHealth network shall be to: (a) work towards delivering sustainable economic and social benefits of European eHealth systems and services and interoperable applications, with a view to achieving a high level of trust and security, enhancing continuity of care and ensuring access to safe and high-quality healthcare; (b) draw up guidelines on: (i) a non-exhaustive list of data that are to be included in patients' summaries and that can be shared between health professionals to enable continuity of care and patient safety across borders; and (ii) effective methods for enabling the use of medical information for public health and research; (c) support Member States in developing common identification and authentication measures to facilitate transferability of data in cross-border healthcare."

The next Section of this report describes the work of the eHealth Network that was put in place in response to those provisions.

The eHealth Network

The Commission has issued an Implementing Decision putting basic mechanisms in place for the eHealth Network[291].

The eHealth network seems in principle to be a suitable mechanism for coordination between the Member States and the Union, but achievements and ambition to date appear to be modest. A first meeting was held on 8 May 2011, a second meeting on 7 November 2012, and presumably a third meeting in May of 2013 (meeting minutes for the third meeting are not yet publicly posted).

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[290] European Parliament & European Council, 2011a.

[291] Commission Implementing Decision of 22 December 2011 providing the rules for the establishment, the management and the functioning of the network of national responsible authorities on eHealth (European Parliament & European Council (2011b) 'Regulation amending the Staff Regulations of Officials and the Conditions of Employment of Other Servants of the European Union COM(2011) 890 final).

The primary outcome of the first meeting of the eHealth Network was adoption for the Multiannual Work Programme 2012-2014 of three priorities: (1) e-Identification for e-Health, (2) interoperability (particularly semantic) interoperability, and (3) interoperability of data bases for medicinal products. The meeting also adopted the position of the *eHealth Governance Initiative (eHGI)* "Conclusions on eIdentification EU Governance for eHealth Services", after amending "developing common identification and authentication measures to facilitate transferability of data in cross-border healthcare" to add "on the ground of mutual recognition" as underpinning principle and respecting the diversities of eIdentification systems for health across Member States.

The minutes of the second meeting suggest what might have in any case been anticipated: that the de-funding of the proposed Connecting Europe Facility will have an impact on the pace of eHealth deployment, as on e-Government in general. "Up to 2 billion EUR are foreseen to finance public digital services and infrastructure, e.g. for eHealth." Indeed, the "Strategic priorities of the eHealth Network- Multiannual Work Programme 2012-2014" of 19 October 2012 includes a sixth priority: "Sustainability: Recommendations on the governance of the Connecting Europe Facility (CEF)", with completion targeted in May 2013.

The minutes of the second meeting also note the intent, apparently on the part of the Commission, to launch a legal study in February 2013 to examine how national laws on electronic health records (e.g. ePrescriptions) interact with cross-border provision of eHealth services and cross-border exchange of health data. The results of the study would be used as a basis for discussion with Members' legal experts to explore the way forward for creating a sustainable and supportive legal environment for cross-border eHealth services.

Notably, the second meeting approved a Multiannual Work Programme 2012-2014 with the following elements, all presumably due for completion at the end of 2014:

- Common identification and authentication measures based on national solutions to support electronic transferring of data in cross-border healthcare settings;

- Guidelines on semantic and technical interoperability;

- Guidelines on legal interoperability;

- Guidelines on non- exhaustive list of data to be included in patient's summary; Guidelines for cross-border electronic exchange of patients' summary data set;

- Guidelines on interoperability of ePrecriptions;

- Sustainability: Recommendations on the governance of the Connecting Europe Facility (CEF).

On the one hand, this is an impressive list that might in theory put in place a great many of the necessary enablers for cross-border eHealth capabilities.

A less optimistic interpretation is, however, equally appropriate. The Work Programme contains few specifics beyond a list of relevant literature. The issues to be studied are not new – most were already explored thoroughly in the course of the epSOS Large Scale Pilot programme. It would be fairly easy for the eHealth Network to produce high level statements of principles, similar to the "Conclusions on eIdentification EU Governance for eHealth Services" that were approved at their first meeting, that would fall far short of that which is needed for implementation but would nonetheless ostensibly fulfill the objectives of the Multiannual Work Programme. Were this to be the case, Europe would scarcely be closer to comprehensive, cross-border implementation of ubiquitous eHealth service in 2014

(eighteen months from now, and three years after enactment of the 2011 Directive on cross-border services) than we are today.

The Commission's Communication on the eHealth Action Plan 2012-2020

The Commission's 'Communication on the eHealth Action Plan 2012-2020'[292] expresses a sensible view of how to proceed in regard to ensuring interoperability and cross-border functionality of eHealth applications; however, it could be said to be lacking ambition in terms of the time scale for implementation.

The Communication provides a crucial definition: "Interoperability is where two or more eHealth applications (e.g. EHRs) can exchange, understand and act on citizen/patient and

other health-related information and knowledge among linguistically and culturally disparate clinicians, patients and other actors or organisations within and across health system jurisdictions, in a collaborative manner."

In the Communication, the Commission proposes to work at the technical and semantic level, at the organisational level, and at the legal level.

At the technical level, the Commission commits to propose by 2015 "…with the endorsement of the eHealth Network [see Section 0] an eHealth Interoperability Framework based on the results of studies, pilots and research projects." More specifically, they commit beginning in 2012 to "…support the eHealth Network in producing guidelines on a dataset for patient summary records to be exchanged across borders, common measures for interoperable electronic identification and authentication in eHealth and will enhance security of health information and eHealth services and interoperability of databases for medicinal products." They further propose to "… seek the endorsement of the eHealth Network to: establish the semantic and technical cross-border interoperability specifications and assets necessary for the eHealth Interoperability Framework; [and] propose an EU interoperability testing, quality labelling and certification framework for eHealth systems.In doing so, they propose to draw on assets "such as vocabularies … taken from past projects or ongoing projects developed under CIP, FP7, the ISA work program."

At the organisational level, the Commission merely commits to take appropriate steps without specifying what these might be. At the legal level, they propose to launch a study to examine Member States' laws on electronic health records in order to make recommendations to the eHealth Network on legal aspects of interoperability.

Taken as a whole, all of this seems to be in the right direction, and draws appropriately on past and present initiatives; nonetheless, it is striking that there are hardly any deliverables before 2015, and even these are in the forms of studies rather than concrete measures to deliver benefits to European citizens.

Observations

European experience with implementation of eHealth applications, both within Member States and between them, demonstrates that *implementation of ubiquitous eHealth applications is neither hopeless nor easy*.

Within Member States, success appears to depend critically on the degree to which underlying health records have already been digitised. Two of the apparently more advanced European implementations, in the UK and the Netherlands, are also in two of the Member States where 90% of health records are already available in digital form.

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[292] European Commission, 2012d.

Even at national level, the experience of the Netherlands (which failed to achieve an integrated system of eHealth records at *national* level, and which was substantially delayed by fears of U.S. interception of the personal health data) is worrisome.

Cross-border eHealth services pose greater challenges because the underlying health delivery services are implemented at Member State level (and appropriately so), and are not identical. Cross-border eHealth services could map from one service to another to a considerable degree, but cannot by themselves create more consistency than is present in the underlying services.

Nonetheless, the results of the epSOS Large Scale Pilot are promising. They demonstrate that cross-border interoperability of eHealth systems could, in principle, be achieved. Experience with epSOS also tends to confirm what was long felt – that cross-border interoperability of eHealth systems in Europe will have to address serious challenges at (1) the technological and semantic level, (2) the organisational level, and (3) the legal level. In sum, experience with epSOS illustrates that implementation of ubiquitous eHealth applications is neither hopeless nor easy.

The mechanisms that are being put in place by the Commission's proposed plan 2014-2020 and the eHealth Network are appropriate in principle. Our primary concern is that they are lacking in ambition to the extent that only paper deliverables are foreseen between now and 2015, and that the degree to which even those deliverables will enable actionable plans is unspecified. The existing vague commitments could be vacuously satisfied by high level concept papers that, in terms of implementation, would be of little or no value. In other words, so far as we can see, not even a 'plan for a plan' is visible today.

We believe that the already committed deliverables of the Commission and the eHealth Network for 2014 and 2015 should be expanded to include concrete planning with specific dates and commitments to operational systems (subject to funding by the European institutions).

7.2.3. e-VAT and e-Customs

The term e-VAT is somewhat ambiguous; it covers electronic handling of regular VAT and VAT on e-Services; however, both are suitable areas for further action to promulgate and implement ubiquitous services.

Electronic handling of VAT

The tax authorities in various Member States have specific rules for allowing businesses to carry out a range of functions in relation to VAT:

- *Registration for VAT*[293]*:* this is a candidate for cost reduction and uniform treatment of large and small enterprises, with the additional advantage of facilitating harmonised cross-border registration of firms trading throughout the Single Market. The implied verification of identity could, in principle, provide a low-cost means of minimising certain types of VAT fraud;

- *Electronic/online submission of VAT returns*[294]*:* this can reduce trading costs and compliance asymmetries between large and small firms and between foreign and domestic firms, it can also help minimise the burdens associated with reporting requirements, and tax equalisation for firms trading in multiple national markets, and can potentially provide a more sensitive instrument for detecting and deterring VAT fraud and evasion. It can also minise data interchange complexities between Member States' tax authorities;

- *Online VAT payments*[295]*:* this can simplify and accelerate VAT settlements, reducing barriers to competition and potentially easing the costs associated with payment processing (especially on the government side) and with late payment and settlement (refund) scheduling, which in turn can minimise cash-flow pressures that currently inhibit SME participation; and

- *Use of e-invoices to support VAT returns*[296]*:* this can improve alignment between modern business and market processes and the tax authorities, making the legal as well as the market environments more similar across Member States. It also reduces costs of compliance (especially for SMEs) and helps improve VAT performance for the complex and fluid transactional arrangements that increasingly characterise modern markets, especially when they span national markets. The acceptability of a common level of evidence can also facilitate such partnerships and reinforce realisation of the other advantages of e-invoicing.

The potential benefits of e-VAT are thus clear, in terms of cost reduction, uniform treatment of large and small enterprises, and facilitating harmonised cross-border operations throughout the Single Market. Nonetheless, past experience has shown that the cost and operational efficiencies made possible by the implementation of e-Vat systems are limited by differing Member State capabilities to implement IT-based solutions in the remaining areas of cross-border digitalisation, such as VAT refunds.

VAT on e-Services[297]

The scope for expanding ubiquity in relation to VAT on e-Services reflects the requirements laid down in the VAT Directive[298]. In particular, it refers to arrangements developed after the May 2002 adoption of the Directive on VAT on e-Commerce.

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[293] e.g. HM Revenue and Customs, 'Changing or cancelling your VAT registration', http://www.hmrc.gov.uk/vat/managing/change/index.htm.

[294] e.g. HM Revenue and Customs, 'VAT Returns and accounts', http://www.hmrc.gov.uk/vat/managing/returns-accounts/index.htm.

[295] e.g. HM Revenue and Customs, 'Payments and refunds of VAT to or from HM Revenue & Customs', http://www.hmrc.gov.uk/vat/managing/payments/index.htm.

[296] e.g. HM Revenue and Customs, 'Electronic invoices: VAT rules for issuing and receiving', http://www.hmrc.gov.uk/vat/managing/charging/e-invoices.htm.

[297] Discussion in this section is based in part on material available at the relevant European Commission web site: European Commission, Taxation and Customs Union, 'VAT on electronic services: The new legislation', http://ec.europa.eu/taxation_customs/taxation/vat/traders/e-commerce/.

One of the most pressing issues, in light of differences in VAT rates and implementation procedures in different countries[299], is the tension between the origin and destination principles for taxation[300]. Despite the current concensus on the country of origin principle, the complexity of modern e-service value chains, and the variety of entities involved in 'supplying' a service, are likely to create new pressures on the mechanisms for determining how to charge and account for VAT. In this regard, a transparent, common and ubiquitous (technical) system can help to restore workability to what might otherwise become an impracticable system. In so doing, it can minimise distortions to cross-border partnership (as well as trade), minimise vertical integration (including net neutrality) problems and establish an analytic base for discussions on reforms to the current VAT system.

The problem with the country of origin principle is connected to the definition of the 'place of supply' for e-services subject to VAT. Some of these services fall naturally under the default (origin) rule. If e-services such as financial or legal advice are taxed in the service provider's country of establishment, customers can shop around in ways that have the advantage of reinforcing a Single Market in such services. The country of origin principle can however potentially encourage a 'race to the bottom' in tax on specific services and/or a reinforcement of locational market power, as service providers relocate to low-tax countries and (as was recently seen with Amazon) as firms established in more than one member state issue invoices from the lowest-tax jurisdiction[301].

Meanwhile, the rules are expected to change in 2015 for a range of remotely-supplied potentially ubiquitous e-services such as telecoms, broadcasting and electronically supplied services, when intra-EU B2C provision of these services will be taxed in the customer's Member State. The problem of multiple registrations is meant to be addressed by introduction of a 'one-stop shop'[302] analogous to that applying to non-EU suppliers of B2C e-services (see below). The supplier will register for VAT in a single Member State and will pay all VAT due to *that* country's government at the destination country's VAT rate. These patyments will then be reallocated to the tax authorities in the customers' countries using a specific formula.

One other application deserves specific mention. The rules provide for the supply of e-Services into the EU from outside. Since July 2003, electronic services supplied by non-EU businesses on a business to consumer (B2C) basis to private EU individuals or non-business EU organisations are taxed in customer's country of residence. To remove the need for such non-EU suppliers to register in every EU Member State, the VAT on e-services or VOES scheme allows them to register and settle EU VAT in a single EU Member State of their

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[298] European Council (2006) 'Directive 2006/112/EC of 28 November 2006 on the common system of value added tax'.

[299] The EU rules only set minimum rates for standard VAT (15%) and reduced VAT (5% for goods and services on a definitive list); actual rates applied vary among Member States and products.

[300] VAT on services is paid where the service is supplied (usually the country of establishment of the service provider). It is accounted for in the country of origin using the VAT rate of that country. But there are exceptions; VAT may need to be paid in another Member State, especially for "cultural, artistic, sporting, scientific, educational, and entertainment services." (See: European Commission, Taxation and Customs Union, 'General Overview What is VAT?' http://ec.europa.eu/taxation_customs/taxation/vat/how_vat_works/).

[301] This is not a problem when providing services to non-EU customers, where special provisions define the place of supply as the *destination* country for e.g. advertising, expert services, consultancy, transfers of intellectual property, law, financial services, electronically supplied services, telecoms and broadcasting. See e.g. Pastukhov, O. (2007) 'The E-VAT Directive: Mitigating Tax Competition or Spurring It?' Journal of International Commercial Law and Technology 2(2), pp. 54-57; Kox, H. (2011) 'A retrospective evaluation of elements of the EU VAT system - Final Report', http://works.bepress.com/henk_kox/50.

[302] This one-stop shop has been in place since 1 January 2010. It replaced paper applications to each refunding government with an electronic system for applying to all refunding countries through the suppliers' home jurisdiction. It was partly intended to reduce compliance burdens, though current evaluations (Kox, 2011) suggest that "any such potential gains have so far been overshadowed by major practical problems associated with the introduction of the new IT systems in the member states."

choice. Note that this does not apply to non-EU businesses who deal exclusively with EU customers (because those customers would handle the VAT accounting). The scheme does not apply to services that only use the network as a means of communication, but does cover such 'value-added services' as web-hosting; software downloads (including updates); downloads of content (images, text, information (including database access), electronic books, music, games and video); and electronic auctions[303].

Of course, the relevance of this area for Community level action depends on subsidiarity. This is an easy case to make, as the principle justifications arise from cross-border pan-European supply of services and international service supply. One could strengthen this by noting that the objective is to make the application of VAT uniform, but without forcing uniform rates. To quote from an impact assessment on the treatment of vouchers in the VAT Directive: "Action by Member States alone could not achieve the objective of uniform application of VAT due to the possibility of different interpretations of rules. The current legislation is not clear and its heterogeneous application by Member States is the main reason for the problems being encountered. Clarifying the VAT treatment of taxable goods and services supplied against vouchers requires an amendment of the Directive. The relevant VAT rules are set out in the VAT Directive. These rules can only be amended via the Community's legislative process. The proposed changes of the VAT Directive are needed in order to re-establish neutrality and this falls under the exclusive competence of the Community. The proposal aims at a harmonised interpretation and application of the VAT rules through a common definition of vouchers. This will require that Member States apply the same rule and so avoid distortion in taxation, eliminating double or non-taxation. The reasons set out above are clear and the scope of the proposal is limited to what Member States cannot satisfactorily achieve themselves and can only be achieved with Community legislation"[304].

e-Customs

Customs arrangements are coming under increasing strain due to growing responsibilities and the effects of globalisation; greater trade flows, increasingly complex supply chains, an ever faster pace of business and the globalisation of terrorist risks. Meanwhile, the economic crisis has limited the available public resources, so the customs union must do increasingly more with increasingly less. Therefore, implementing customs reform is becoming both more important and more challenging. As mentioned above, customs legislation and implementation has repercussions on the Single Market. Differences in the handling of customs procedures can distort patterns of trade across the customs union in terms of access to markets by non-EU economic operators, thus jeopardising the development of the Single Market. Furthermore, differences in customs processes and associated compliance costs could create incentives for non-observable customs competition, such as re-routing of telecommunications traffic to countries with lower barriers.

The electronic customs project initiated by the European Commission in 1997 aims to place customs procedures on an EU-wide electronic basis with the goals of enhancing security at the EU's external borders and of facilitating trade. It is governed by a periodically upgraded

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[303] Most authorities are at pains to stress that such electronic schemes, which run over the Internet as well as applying to services supplied that way, are alternatives to conventional means of complying with VAT rules; in particular, network problems are not an acceptable reason for failure to register, provide information in an accurate and timely fashion, and make payments.

[304] European Commission (2012f) 'Impact Assessment Accompanying the document Proposal for a Council Directive amending Directive 2006/112/EC on the common system of value added tax, as regards the treatment of vouchers', draft, http://ec.europa.eu/taxation_customs/resources/documents/taxation/vat/key_do cuments/legislation_proposed/swd(2012)127_en.pdf.

Multi-Annual Strategic Plan (MASP)[305]. The most important legal instruments in the framework are:

- The Security and Safety Amendment to the Customs Code, which defines the objective of full computerisation of all procedures related to security and safety[306];

- The Decision on the Paperless Environment for Customs and Trade (Electronic Customs Decision) which sets the basic framework and major deadlines for the electronic customs projects[307]; and

- The Modernised Community Customs Code (MCC), which provides the legal basis completing the computerisation of customs while being currently subject to a recast as a Union Customs Code[308].

The MCC is supposed to be the main vehicle for ubiquity in the Customs union. However, its implementation has been severely delayed. Several actions envisioned in the MCC, MASP and the paperless customs Directive have not been fully implemented; thus, the original deadline of June 2013 was not met (e.g. for the Single Window or Single Authentication systems). Moreover, the main policy and legislative documents are currently awaiting a recast to take into account Council feedback on the overall progress of the Customs Union and other recent developments. The delay has been estimated to cost up to € 2.5 billion in annually foregone savings from lower compliance costs and as much as € 50 billion from retarded expansion of international trade[309].

The Commission acknowledged Member States' need for well-defined specifications available well in advance of customs procedure reforms, as public administrations and businesses also need time to develop and implement their own applications. The need to adapt IT applications has been pointed out as the central reason why companies need more time[310]. Despite the fact that the Member State administrations have access to a European wide secure network (CCN/CSI3) supporting the key 'e-customs' systems, the Customs Union faces problems of interoperability and excessive complexity, as businesses have to connect to multiple systems in the Member States where customs activities take place to access different processes. This multiplication of systems and interfaces increases the administrative burden and compliance costs.

Safe and reliable exchange of customs and security-related information with third countries also requires development of secure, consistent, and EU-wide IT solutions. Member States face different levels of burden in terms of control activities for safety and security as a function of their law enforcement endowments and geographical position. The imbalance is

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[305] European Commission, 2012k.

[306] European Parliament & European Council (2005b) 'Regulation No 648/2005 of 13 April 2005 amending Council Regulation (EEC) No 2913/92 establishing the Community Customs Code Official Journal L 117'; European Commission, 2012h.

[307] European Parliament & European Council (2008a) 'Decision No 70/2008/EC of 15 January 2008 on a paperless environment for customs and trade'.

[308] European Parliament & European Council (2008b) 'Regulation No 450/2008 of 23 April 2008 laying down the Community Customs Code (Modernised Customs Code). Following the Lisbon Treaty, a recast of the Modernised Customs Code was necessary, which would split the MCCIP (Modernised Customs Code Implementing Provisions) into two separate acts: an implementing act and a delegated act. It was not anticipated that this would take significant time to implement. However, drafting and adoption encountered significant delays in part due to difficulties in implementing changes across the disparate IT systems adopted by Member States. European Parliament (2011b) 'Resolution on modernisation of customs', 2011/2083(INI).

[309] London Economics, 2013.

[310] European Parliament (2011a) 'Report on modernisation of customs', 2011/2083(INI); European Commission, 2012k.

particularly heavy in terms of investment in infrastructure capacity building and technology[311].

As the Impact Assessment for the proposed revision of the customs and taxation regulation 2014-2020[312] pointed out, each Member State is currently responsible for implementing its national systems according to common specifications, resulting in 27 (at the time of the Assessment) developments for each system, trader interfaces, schedules of development, sets of project related or operational difficulties, and so on. In particular, in light of the financial crisis, the Commission considered that the development of IT systems should be done more efficiently. This would entail an increased allocation of central resources and increased involvement of Member States in common projects. Therefore, similarly to developments in e-VAT, buy-in or top-down regulation might be necessary for Member States to ensure harmonised customs rules, information exchange systems and data formats to a level that successfully improves the context for international and intra-EU trade for European businesses.

7.3. Precautions to avoid disruptions

Relative to the deployment of cloud services (which is the core of this study, together with ubiquity and big data), key concerns include security, reliability, robustness, data protection, jurisdiction, lack of standardisation, data ownership, intellectual property rights, and differences in national policy[313].

No single policy instrument will address all of these; however, policy instruments (many of which are of as-yet unknown effectiveness) are already in place or planned that could deal with most aspects.

The European Commission's communication on cloud services identified three key areas in which it found that action was needed: a) fragmentation of the digital single market due to differing national legal frameworks, (b) problems with contracts due to worries over data access and portability, change control and ownership of the data, and (c) the jungle of standards and lack of certainty as to interoperability[314].

Most of the necessary steps have already been identified as actions of the Single Market Pillar of the Digital Agenda for Europe and the Single Market Act[315], such as the simplification of copyright clearance and cross-border licensing. In addition to these steps, the European Commission proposed to launch three cloud-specific actions: 1) cutting through the jungle of standards, 2) safe and fair contract terms and conditions, and 3) establishing a European Cloud Partnership to drive innovation and growth from the public sector. Other supporting actions that the Commission proposes to take as regards cloud computing are described in Section 6.1.5.

Chapter 8 provides our view of the steps that should be taken in regard to the use of cloud and ubiquitous technologies for public and commercial services, not only to minimise disruption, but to enhance the socio-economic welfare of Europeans overall.

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[311] European Parliament, 2011a; European Commission, 2012k.

[312] Proposal for a Regulation Of The European Parliament And Of The Council establishing an action programme for customs and taxation in the European Union for the period 2014-2020 (FISCUS) and repealing Decisions N°1482/2007/EC and N°624/2007/EC {SEC(2011) 1317 final} (European Commission (2012) 'Taxud.a.3 ARES (2012) 1677638 Working Document: Electronic Customs Multi-Annual Strategic Plan 2012 REVISION MASP Rev 11 Version 3.0 For the purposes of ENDORSEMENT by the Customs Policy Group (CPG) following approval by Electronic Customs Group (ECG) on 03 December', http://ec.europa.eu/taxation_customs/resources/documents/customs/policy_issues/e-customs_initiative/masp_strategic_plan_en.pdf).

[313] European Commission, 2012d.

[314] DAE, 'European Cloud Computing Strategy'.

[315] European Commission, 2011d.

8. ASSESSMENT OF POTENTIAL ACTIONS AT EUROPEAN LEVEL

KEY FINDINGS

- We have found it convenient to assess the potential value of possible policy interventions using Impact Assessment. Impact Assessment is a standard analytic tool in European policymaking, and well suited to this purpose.

- In terms of potential policy actions at European level, we have identified four broad approaches. They are not mutually exclusive, but rather lend themselves to being combined in some fashion.

- OPTION 2 : Sharing and promotion of best practices

- OPTION 3 : Comprehensive implementation of a modernised European Interoperability Strategy

- OPTION 4 : Centralised implementation of modern e-government services

- It is often the case that centralised solutions offer greater economies of scale, but less ability to accommodate legitimate national or local preferences. That appears to be the case here. The higher numbered options typically offer efficiency gains, but at the cost of less ability to adapt to local needs.

The terms of reference for the study call on us to consider the costs and benefits of the current and future evolution of ubiquitous markets and ubiquitous governance under current arrangements (where only limited instruments exist to coordinate relevant policy at European level) with alternatives where the Union might play a more active coordinating role. This effectively asks us to identify a range of options for potential policy interventions at European level, and to assess relative costs and benefits associated with each. We provided an informal Impact Assessment, broadly following the Commission's 2009 Guidelines, as a structured means of conducting the analysis. It is a tool that is well suited to the task that we were asked to perform, and provides results in a form that is familiar to the Parliament.

Under the Commission's 2009 Guidelines[316], the impact assessment consists of:

- Procedural issues and results from consultation of interested parties;

- Policy context, problem definition, and subsidiarity;

- Objectives;

- Policy options;

- Analysis of impacts;

- Comparing the options;

- Monitoring and evaluation.

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[316] European Commission (2009a) 'Impact Assessment Guidelines', SEC(2009) 92.

Many of these required elements are of limited interest to readers who are not specialists in Impact Assessment methodology. We have concentrated in Chapter 6 on the problem definition, the policy context, and the general objectives. In this chapter, we follow the Impact Assessement framework more closely in developing Options (and Sub-options if needed) that address current and future challenges, in analysing and comparing the likely impacts of these options, and in returning to the questions of subsidiarity and proportionality first touched on in Section 6.3.

8.1. Potential actions at European level

A range of Options could be considered. They differ primarily in the degree to which they involve centralised versus decentralised control.

- OPTION 1: As always, 'business as usual' (i.e. with no change at European level) is an Option that must be considered, and that represents a baseline against which any change can be measured.

- OPTION 2: A second level of intervention entails a general 'joining up' of activities through coordination at European level, without however intruding on Member State activities. We characterise this as "Sharing and promotion of best practices".

- OPTION 3: A third level would include all activities of OPTION 2, but would also a more active European role in (1) revitalising existing programmes such as the EIS and sTESTA, (2) modernising them to take advantage of new technology and approaches such as cloud computing and big data, and (3) in areas such as eHealth, moving beyond vague concept papers to begin concrete planning with dates and budgets. Furthermore, it would include constant exploration of additional policy areas.

- OPTION 4: Would seek centralised implementation of e-government services wherever practical. The mechanisms of OPTION 3 would be used for services where centralised implementation is not feasible or desirable.

Table 22:   List of options

Policy option	Description
OPTION 1: Business as usual	Ongoing initiatives such as the EIS and sTESTA continue unchanged. No specific new policy at European level.
OPTION 2: Sharing and promotion of best practices	Ongoing initiatives such as the EIS and sTESTA continue unchanged. The EU takes an active role to encourage sharing of best practice among Member States, and encourages the use of more modern technology in e-government systems.
OPTION 3: Sharing and promotion of best practices, comprehensive implementation of a modernised European Interoperability Strategy, reinvigoration of e-ID and of eHealth and other promising areas	The EU takes an active role to encourage sharing of best practice among Member States, and encourages the use of more modern technology in e-government systems. The EIS is reviewed and where appropriate modernised to reflect newer concepts including cloud services, big data, and ubiquity in general, and is implemented comprehensively. Promising areas such as e-ID and eHealth are reinvigorated, and are underpinned by concrete planning with committed delivery dates and budgets. Multiple large scale demonstration projects (such as e-customs and e-VAT) are successfully implemented in multiple Member States. Constant further exploration to address additional policy areas.
OPTION 4: Centralised implementation of modern e-government services.	The measures of Option 3 are implemented for services that do not lend themselves to centralised implementation. Wherever possible, e-government services are implemented centrally, with due consideration of subsidiarity, privacy and security aspects.

Each of these Options contains elements that correspond to existing programmes which, in most cases, are delayed, of uncertain effectiveness, or both (see Section 6.1.5). In many cases, the most expeditious way to implement the Option will be to rigorously analyse the shortcomings of the existing initiative (by means, for instance, of an ex post evaluation) and to correct them.

8.2. Analysis of impacts and comparison of Options

Centralisation versus decentralisation is a standard topic of discussion in the political science literature, and is certainly a relevant dimension here. For these services, and in general, centralised operation tends to enable economies of scope and scale, but at some cost in terms of the ability to accommodate legitimate local needs and preferences.

Ranking the four identified Options along the dimensions of effectiveness, efficiency and coherence and their subordinate dimensions (as identified in Section 6.4), we see not surprisingly that the less intrusive lower-numbered Options rank better on accommodation of local needs and preferences, but lower on efficiency.

Table 23:   Overall assessment of options

	OPTION 1: Business as usual	OPTION 2: Sharing and promotion of best practices	OPTION 3: Option 2 plus full realisation of a modernised EIS reinvigoration of eID and of eHealth and other promising areas	OPTION 4: Centralised realisation of modern e-government services.
Effectiveness	0	+	+	++
Direct costs to the EU	0	▬	▬	▬▬
Direct costs to the Member States	0	0	▬	+
Coordination costs to the Member States	0	0	▬	▬▬
Efficiency	0	+	+	▬
Coherence	0	+	++	++
Accommodation of national, regional and local preferences	0	0	▬	▬▬
Promotion of free movement of goods, capital, services and people	0	0	++	++
Overall assessment	0	+	++	+

0 = no change; **+** = better; **++** = much better; ▬ = worse; ▬▬ = much worse.

Consistent with Impact Assessment practice, we see our role as identifying trade-offs for policymakers rather than advocating a single way forward ourselves. At the same time, we would note that it is likely that some mix of the three Options will prove to be most appropriate.

Returning to questions of subsidiarity and proportionality, it is fairly clear that Option 2 (sharing of best practice) does not intrude on Member State prerogatives, and does not necessarily require much more than dialogue. Option 4 (centralised implementation) would

have the highest threshold to cross, in that it is more expensive and also more intrusive on Member States; however, it might well be warranted for applications where there is substantial commonality across the Member States.

9. FINDINGS AND RECOMMENDATIONS

The overall aim of this study was to analyse the potential of ubiquitous solutions for the European Digital Single Market. The underlying premise of the study is that new developments, such as cloud computing, information processing, automation and mobile connectivity, offer new tools creating value for consumers and businesses operating in the Single Market. By offering ubiquitous services, governments could lower transaction costs, improve access and give an economic boost by creating more innovation and new demand.

At the outset, we present our findings, generally following what was presented in the body of this report. We conclude with our recommendations going forward.

9.1. Findings

We present our findings in the same sequence in which they appear in the body of the report.

9.1.1. Ubiquitous solutions in non-EU jurisdictions (Chapter 2)

Development of ubiquitous solutions, and especially of ubiquitous e-government solutions, in a number of front-runner non-EU countries are impressive. Infrastructure investments in FTTP and in mobile (LTE) in a number of these countries outstrip those of their EU counterparts.

- Governments around the world are heavily investing in building blocks for ubiquitous services (e.g. high speed broadband, sensor networks). The precise understanding of ubiquitous services differs across countries and regions (e.g. Asia and North America), but they have several elements in common, such as real-time and continuous access via several platforms to intelligent (e.g. based on context-aware data) services.

- South Korea's u-strategy aimed to create the 'world's best u-society', based on an anytime/anyplace connection. The plan focused on creating a 'top level' u-infrastructure also aimed at offering services for mobile devices. This includes bringing 50-100 Mbps to 95% of the 20 million Korean households. In 2010, the government set up its Smart Korea IT Plan, aimed at convergence and enhancing the infrastructure that has been laid out.

- The Smart Korea program focuses on connecting the physical infrastructure, including broadband internet and RFID technology with different types of devices, software, platforms and network technologies, developing ubiquitous services. The integration of resources within government is to save costs of system construction by 52%. Currently, the government is also implementing its Giga Korea plan (2013-2020) aiming to upgrade bandwidth yet again to 10 Gbps for the fixed network and 1 Gbps for the mobile network.

- In the Korean context, the notion of ubiquity is largely implemented on the local level, in the many u-City projects. A u-City is a "city fully equipped with networks through which authorities can monitor almost everything that is happening in the city and take necessary measures on the spot, and residents can have access to necessary information and services for their daily lives."

- Korean u-services include customised services portals for citizens (Korea e-Government Portal, www.korea.go.kr) and integrated services for businesses (Government for Business Portal, www.g4b.go.kr), an e-people portal for digital complaints and initiatives, electronic procurement, e-learning, and e-Customs/u-

Port systems. As South Korea pushes hard to achieve ubiquitous services in all areas, this has earned the county the first ranking in the UN e-government benchmarks of 2010 and 2012.

- Japan's ubiquitous policies aim to use ICTs to cope with challenges, such as health care issues due to a rapidly aging society, environmental issues and energy shortage, and public safety. Measures of success include 80% of the population to feel comfortable using ICTs and appreciate the benefits of ICTs in resolving social problems through social reform and human development. Services provided in Japan include e-Health services, e-Learning initiatives, e-Tax and e-Customs services, and smart city projects.

- The whitepaper on Information and Communications in Japan from 2004 stated: "A ubiquitous networked society is becoming a reality in which anyone with any device at any time from any place can access a network and freely exchange information." The Japanese Ministry of Internal Affairs and Communications (MIC) started a study on ubiquitous networking around 2000 and in 2002 issued a report on 'Ubiquitous Networking'. It argued that the context aware computing environments embedded in our real world interconnected by broadband fixed/mobile networks will greatly enhance services to end users and bring convenience and security to all people.

- Central to the US strategy is 'government 2.0' focusing on transparency, participation, and collaboration. For example, a general ubiquitous strategy is pursued by the website USA.gov. Furthermore, a great number of initiatives exist that serve as meta-websites providing an overview of existing services via plattforms, such as data.gov and healthcare.gov. These initiatives often involve government-citizen interaction through social media.

- In Canada, no national e-government policy framework exists. Federating Identity Management is seen as one central element towards achieving a citizen-centered service model. Another aim is to foster the use of cloud technology in government services to make them ubiquitously accessable and to achieve more efficiency in the provision of government services. As is the case in the US, many initiatives exist on the agency or local (state, province or town) level.

- Where South Korea and Japan are predominantly investing in the development of advanced infrastructures (e.g. broadband convergence networks, sensor networks), the investments of the US and Canada seem to be more dispersed and cover all kind of initiatives ranging from the opening up of government data to government-citizen interaction through social media.

- In South Korea and Japan, policy initiatives and service development are strongly driven by the central government, often forging public private partnerships, in the US and Canada this often takes place at the level of the state or local government, stimulating private initiatives.

9.1.2.   Ubiquitous solutions in EU Member States (Chapter 3)

Development of ubiquitous solutions, and especially of ubiquitous e-government solutions, *within* a number of front-runner EU Member States is also quite impressive. Fixed and mobile broadband coverage are nearly universal, cable covers much but not all of the European population, but FTTP and in LTE deployment are for the most part not on a par with global leaders.

- The eEstonia strategy is based upon the assumption that successful introduction of e-services is built on a decentralised, distributed system in order for all components to be linked or added on a platform-independent basis. Centralised databases or systems are avoided. Small, efficient projects are favoured over large-scale developments. Four goals of the 'ubiquitous' strategy are to be particularly stressed: 1) provide inexpensive internet access to citizens, 2) digitalise data necessary for government services, 3) formalise and standardise the exchange of these data, and 4) introduce a digital identity.

- Ubiquitous solutions in Estonia cover a wide range of services. Large-scale solutions include the common public infrastructure X-road, the Electronic ID Card and Digital Signature identification and authentication services, electronic registers such as the e-Business Register, Land Register and Population Register, e-Health initiatives such as e-Prescription and Electronic Health Records, and a State e-Services Portal. Smaller scale solutions include DigiDoc, e-Cabinet, e-Police, e-Tax, e-Law, e-School, Internet Voting, m-Parking, mobile-ID, m-Payment, location based services for rescue workers, and social welfare e-Services.

- In the UK, until recently, electronic services were implemented in a centralised manner. Budget cuts has resulted in a very decentralised way of implementation, spurring questions of where to invest. Focus in the UK has been on the rollout of broadband internet and on the development of centralised portals. The G-Cloud and CloudStore focus on introducing cloud ICT services into government departments, local authorities and the wider public sector. About 50% of suppliers accepted for CloudStore were SMEs. Other e-Services include the NePP e-Procurement system, e-taxation, and the use of electronic services for law and order. The set-up of a National Health Record system faces considerable difficulties and is delayed.

- The Netherlands ranks second (after South Korea) on the UN e-government benchmark of 2012 and provides a wide range of electronic services. It does not use the term 'ubiquitous' as such, but includes its characteristics as part of its e-government strategy. Central to the current e-government i-NUP program are standardisation and interoperability of government registrations. Electronic services range from businesses and citizens' portals, the DigiD electronic authentication mechanism, the DigiPoort e-Procurement system, e-Tax system with prefilled forms, e-Customs and national patient records. Its Rijkscloud cloud computing system is implemented separately from the internet.

- Germany had policy frameworks for electronic services in place on three levels: the federal, state, and local level. This is reflected in the dispersed services development. On the federal level important policy frameworks are the setup of online registers for citizens, motor vehicles, and possession of firearms, as well as the investigation for solutions for national identification and authentication. Furthermore, on the federal level a number of portals are set up that provide an overview of electronic services, such as a federal information and knowledge management system, a public services register, a public authorities finder and a performance catalogue.

- Services development on the federal level are the e-identity smart card and the electronic job board. On the local level, the Friedrichshafen smart city (T-city) project implemented an array of smart services, including networked cars, telemedicine, smart metering, and several e-learning solutions.

- When looking at the list of services provided, the front-runner Asian countries involved in this study and the front-runner EU Member States provide a similar

range of services. While South Korean and Japan are investing heavily in infrastructure, especially for mobile phones, the focus of leading EU Member States is on the development of citizen-centered services.

- Based on the United Nations e-government survey, developments in South Korea, Estonia and the Netherlands are most impressive. They have in common a focus on infrastructure development. But while South Korea strongly focuses on an advanced physical infrastructure, Estonia and the Netherlands focus on the development of an e-government infrastructure around building blocks such as identification and authorisation mechanisms and vital registries.

- Compared to the developments in Asia, the developments in EU Member States are much less centrally developed, but often developments happen bottom-up. Compared to developments in the US and Canada, initiatives are more often led by EU Member State governments.

- Different types of policies can be found in practice: those those that are aiming for spill-over effects for example by providing information or 'nudge' rather than control, and policies that implement and control designed outcomes. While the latter are often found in the Asian countries, the former seem to be more often adopted by EU Member States.

- However, cross-border operations are limited or non-existent. The attempts that have been made at Europe-wide interoperability are all struggling. As a result, many services that are ubiquitous on the level of a particular Member State, are not ubiquitous on the level of the EU, contributing to the fragmentation of the Digital Single Market.

9.1.3. Ubiquitous global market solutions (Chapter 4)

Ubiquitous market solutions, as distinct from specifically e-government solutions, show different tendencies. These solutions tend to be globally available and globally interoperable; however, they tend to deal with much less specialised applications than does e-government.

- Ubiquitous market solutions include a wide range of services and platforms, including eCustoms services developed by SAP, the eBay market place, Microsoft's cloud services and Skype VoIP service, the Facebook Platform and Facebook Connect, a range of offerings from Google, and the Apple app store. The ubiquitous market solutions have been, with the exception of Skype and SAP, developed in the US. Skype, which represents a noteworthy example of a European contribution to ubiquitous services, is now owned by Microsoft. At the same time, many of these US-owned enterprises contribute to the European economy in various ways, including the maintenance of European research centres.

- The ubiquitous market solutions mostly look at EU-level coordination for overcoming barriers they perceive rather than for coordination of services development. For the eCustoms systems SAP is developing, for example, overcoming fragmentation of implementation of regulation is important. Skype and eBay are looking for the protection of net neutrality to overcome the risk of their services being hampered.

9.1.4. Access to Ubiquitous Services via Fixed and Mobile Broadband (Chapter 5)

Fixed and mobile broadband serve as a crucial enabler, providing ubiquitous access to these services.

- Several non-EU Member States have substantially greater deployment and adoption of FTTP (fixed) and/or LTE (mobile) high bandwidth services than does any EU Member State.

- The limited availability of FTTP (mitigated by availability of cable in some Member States) presumably limits the commercial solutions that can be deployed, but probably has only limited adverse impact on ubiquitous e-government applications, which tend to require only moderate bandwidth.

The relative lack of high speed LTE mobile broadband deployment in Europe, however, clearly limits the ability to access these services from anywhere, and at any time.

9.1.5.   An Opportunity For Coordinated Policy At European Level? (Chapter 6)

We have reviewed existing European policy instruments and initiatives that seek to achieve ubiquitous e-government services, assessed their (limited) effectiveness, and considered what the appropriate goals might be for Europe going forward.

- Impressive examples such as that of Estonia make clear that there is no fundamental impediment to achieving valuable results within Europe; at the same time, *the clear fact that services are not available to citizens in every European Member State and across these Member States begs the question: Why not?*

- European citizens and businesses have been found by previous studies to value and demand European e-services, in particular in the areas of secure email access, identification and services to jobseekers from the citizens' side and e-signatures, cross-border procurement and sales – related services from the business side. The main areas for improvement suggested were personalised services (business and citizens), and increased transparency of use of personal data (citizens).

- Some of the policy issues raised by the emergence of ubiquitous services are new, but others have been recognised for many years. Notably, the need for cross-border interoperability and software re-use among e-government services is characterised by significant limitations and has been a long-standing concern at European level.

- The effectiveness of many European e-government services appears to be adversely impacted (1) by lack of public awareness and understanding of them, coupled with overlap between European and Member State programmes (and sometimes even between programmes within a Member State); and (2) by delays in implementation.

- There does not appear to be a substantial shortage of programmes or action lines at European level. For nearly every need that we have identified, some action line already exists, albeit mostly in the realm of soft law and non-binding obligations or fragmented implementation across the EU. Our concern is thus not with a lack of programmatic response; rather, it is that *the action lines in place individually and collectively do not appear to be having much effect on the problem*.

- The actions of the European Commission are very often in the realm of soft law and pilot projects, and only a handful of actions are translated into legislative proposals or the setting up of cooperation and monitoring frameworks so far. Some notable exceptions are the eID and ODR frameworks, as well as the e-VAT and e-customs initiative, that while having a large potential contribution to the realisation of the Single Market and the reduction of economic losses due to the illegal economy, have not managed to fully respect the planned timeframes for realising ubiquitous services. While these services have the potential to enable developments of a

digital single market, they also underpin each other, making possible synergies that are not always fully drawn out in policy documents.

- Europe brings substantial strengths to the deployment of these technologies in commercial and e-government settings, but also some weaknesses. Taken as a whole, they represent a significant opportunity not only to reduce costs, but also to increase government transparency and citizen empowerment.

- A so-called SWOT analysis is a useful tool for gaining a balanced understanding of Europe's *Strengths* and *Weaknesses*, and the *Opportunities* and *Threats* to which Europe is subject in regarding to achieving widespread deployment of ubiquitous e-government services.

- At European level, key objectives for a European intervention might include:

  - Ensuring that existing policy instruments are effective.

  - 'Joining up' e-government implementations so as to achieve realistically realisable economies of scope and scale.

  - Facilitation of data interchange among e-government applications so as to enable cross border interchange of information where appropriate (and with due respect for individual privacy).

  - Coordinating research and standardisation policy so as to avoid needless duplication and waste.

  - Achieving unfragmented operation of the Digital Single Market.

- The principles of subsidiarity and proportionality always play a key role in European policymaking, but subsidiarity is especially salient in this case. In general, e government cannot enjoy a greater degree of commonality across Member States than the underlying government activities that it implements. This implies that for most applications, a 'one size fits all' solution is unlikely to be appropriate; however, there is still considerable scope for action at European level. European initiatives to enhance the cross border interoperability of e-government services, or to improve their efficiency or to encourage the use of more modern and user-friendly technology, offer obvious benefits and are not *per se* incompatible with the principle of subisidiarity.

- Beyond barriers to uptake and deployment of ubiquitous services, the threat of privacy and security breaches represents an ongoing concern.

9.1.6.   Areas Amenable to Coordination at European level (Chapter 7)

We were asked to identify the areas most amenable to policy coordination at European level.

- The various ostensibly ubiquitous systems that we studied differ from one another along at least three primary dimensions: (1) technology, (2) centralisation versus decentralisation, and (3) interoperability (both within countries and, for the EU, among countries).

- A recurrent theme throughout this report is centralisation versus decentralisation. What is the optimal structure for ubiquitous applications, especially those created by governments, within the confederated system that already exists at EU level?

- In light of Europe's inherent fragmentation, fully achieving interoperability and economies of scale and scope across the entire EU is an order of magnitude more complex than in any of the individual countries or Member States that we studied.

- There might be a temptation to confuse centralisation with interoperability, but the systems that we studied demonstrate that they are not necessarily the same thing. A system with a centralised and monolithic implementation is likely to be interoperable across the space that it covers, but it does not necessarily follow that all interoperable systems must be centralised. A decentralised group of implementations can also be interoperable if they all adhere to the same standard protocols and interfaces (such as, for example, the Dutch system for interchange of health records).

- We have identified a number of areas that appear to deserve particular attention regarding EU level coordination:

    - Identification (e-ID), authentication, and authorisation schemes;

    - The European Interoperability Framework (EIF) and related activities;

    - eHealth, including (1) exchange of patient data and (2) ePharmacy;

    - e-VAT;

    - e-Customs.

- Examining progress (or lack of it) to date in each of these areas is instructive.

- In eHealth, for instance, there has been an epSOS CIP Large Scale Pilot Programme in place since 2008, which has developed a great deal of theoretical and practical information about the challenges to the exchange of patient data and to cross-border ePharmacy. epSOS demonstrates that cross-border interoperability of eHealth systems could, in principle, be achieved.

    - Experience with epSOS also tends to confirm that cross-border interoperability of eHealth systems in Europe will have to address serious challenges at (1) the technological and semantic level, (2) the organisational level, and (3) the legal level.

    - Experience to date illustrates that implementation of ubiquitous eHealth applications is neither hopeless nor easy. Despite continued initiatives at European level, widespread implementation of cross-border eHealth services at the present plodding pace could easily be a decade away.

    - We recommend that the already committed deliverables of the Commission and the eHealth Network for 2014 and 2015 in regard to cross-border eHealth systems be expanded to include concrete planning with specific dates and commitments to operational systems (subject to funding by the European institutions).

- The potential benefits of e-VAT are clear in terms of cost reduction, uniform treatment of large and small enterprises, and facilitating harmonised cross-border operations throughout the Single Market. Nonetheless, past experience has shown that the cost and operational efficiencies made possible by the implementation of e VAT systems are limited by differing Member State capabilities to implement IT based solutions in the remaining areas of cross-border digitalisation, such as VAT refunds.

- The *Interoperability Solutions for European Public Administrations (ISA)* programme promotes the European Interoperability Framework (EIF) in order to foster cross-cutting interoperability among e-government applications. It is a follow-on to the IDABC programme that was launched in 2004. The broad objectives seem to us to be appropriate, and to address real needs regarding cross-border e-government

interoperability. This programme appears to promote wide-ranging and useful discourse, but we find little evidence of operational accomplishments or of a sense of urgency.

- Differences in the handling of customs procedures can distort patterns of trade across the customs union in terms of access to markets by non-EU economic operators, thus jeopardising the development of the Single Market. The electronic customs project initiated by the European Commission in 1997 aims to place customs procedures on an EU-wide electronic basis with the goals of enhancing security at the EU's external borders and of facilitating trade.

- Furthermore, other policy pursued on the European level would merit from a close examination of benefits that could be derived from ubiquitous solutions since such solutions require and lead to better coordination of e-government services, as well as to an improved and unfragmented access to them. This is reflected in expectations of EU citizens and businesses in such areas as emergency services, employment, vocational training and education, public procurement, registers, etc. (see Table 1). A detailed analysis of costs and benefits needs to be performed on a case by case basis.

9.1.7. Assessment of Potential Actions at European Level (Chapter 8)

We concluded with an overall policy assessment loosely following European impact assessment methodology.

- We have found it convenient to assess the potential value of possible policy interventions using Impact Assessment. Impact Assessment is a standard analytic tool in European policymaking, and well suited to this purpose.

- In terms of potential policy actions at European level, we have identified four broad approaches. They are not mutually exclusive, but rather lend themselves to being combined in some fashion.

    - OPTION 1 : Business as usual

    - OPTION 2 : Sharing and promotion of best practices

    - OPTION 3 : Comprehensive implementation of a modernised European Interoperability Strategy (EIS)

    - OPTION 4 : Centralised implementation of modern e-government services

- It is often the case that centralised solutions offer greater economies of scale, but less ability to accommodate legitimate national or local preferences. That appears to be the case here. The higher numbered options typically offer efficiency gains, but at the cost of less ability to adapt to local needs.

- Our suggested approach is primarily Option 3, which represents a more activist approach but a suitable balance of centralised and decentralised implementation. It also includes the constant exploration of additional policy areas that may be amenable to benefit from ubiquitous developments.

9.2. Recommendations

Our recommendations fall broadly into two areas:

- Ensuring ubiquitous access to commercial and e-government services;

- Strengthening cross-border interoperability of ubiquitous e-government services.

9.2.1. Ensuring ubiquitous access to commercial and e-government services

As noted, several non-EU Member States have substantially greater deployment and adoption of high bandwidth services (notably FTTP (fixed) and/or LTE (mobile) than does any EU Member State. The limited availability of the very high speeds available via FTTP (mitigated by availability of cable and FTTC in some Member States) presumably limits the availability and financial viability of innovative commercial solutions, but probably has only limited adverse impact on ubiquitous e-government applications, which tend to require only moderate bandwidth.

The exact nature of policy instruments to be used to foster ubiquitous access to services by means of basic and ultra-fast broadband in Europe is well outside the scope of the study, is a central theme of the Digital Agenda for Europe (DAE), and is extensively dealt with in other studies (including a forthcoming study for the ITRE Committee of the European Parliament). Suffice it to say that the potential benefits of ubiquituous commercial and e-government services provide yet another reason why continued attention to the deployment and adoption of fixed broadband appears to be justified.

Recommendation 1. Continue to promote the deployment and adoption of basic and ultra-fast broadband in Europe.

The promotion of widespread deployment and adoption of basic and ultra-fast broadband in Europe continues to be desirable.

The relative lack of high speed mobile broadband deployment in Europe, however, clearly limits the ability of citizens to access these services from anywhere, and at any time. Fixed services are often adequate and Wi-Fi based services are widely used from mobile devices but truly ubiquitous access implies the ability to use services also when one is not in a big city, or when one is truly mobile (as distinct from merely being nomadic, i.e. moving from one stationary location to another). Moreover, for some services (such as emergency services, or the ability to contribute to crowd-sourced information on traffic), ubiquitous mobile access is essential.

A central theme of the Digital Agenda for Europe relates to the availability and speed of broadband services available to Europeans and used by them, but *there is no explicit goal in regard to the availability or take-up of specifically mobile services.*

This does not run counter to the principle of technological neutrality. Mobility is a user-visible characteristic that is available with some forms of broadband, but not with others. Moreover, a wide range of technologies and standards can be used to deliver high-speed mobile access.

Moreover, as noted in Chapter 5, the Digital Agenda for Europe goals identify target broadband speeds, but fail to clarify whether these target speeds are guaranteed, advertised, peak, or average, upload and/or download, and so on. Were Europe to adopt mobile broadband goals, they should be better specified. The specification must pay due regard to implementation costs, which could vary greatly depending on how the goals were specified.

Recommendation 2. Consider adding an objective for *mobile* broadband to the DAE.

> Consideration is needed for an explicit European goal to promote mobile broadband. This could be a candidate for an expansion to the Digital Agenda for Europe. If undertaken, a mobile broadband objective should be defined more fully than the overall broadband goals are described today.

9.2.2. Strengthening cross-border interoperability of ubiquitous e-government services

Our analysis in this study has largely focussed on the broad overall approach to addressing the many challenges that European policy faces (see Section 0 and 0); however, we also provide specific recommendations on steps that should be taken to attempt to get the overall process under better control (see Section 0).

Broad principles

Our assessment of the problem, as abundantly noted in Section 9.1, and substantiated in some detail in our assessment of eHealth in Section 7.2.2, is:

- *The challenges of achieving cross-border integration of European services cannot be solved by technology alone.* It is necessary first to understand and subsequently to address semantic differences, legal impediments, and organisational challenges.

- There is no shortage of policy instruments, and the objectives of most of the existing policy instruments appear to be sensible and appropriate.

- Nonetheless, it is hard to identify a single programme in the entire European e-government space that is delivering the results that could be hoped for.

- Ubiquity and uniformity of service access and delivery does not necessarily entail uniformity of the services themselves. It does not violate subsidiarity or justify resistance by individual Member States, but may facilitate progress towards more effective harmonisation where the characteristics of the service, rather than the means of its delivery, make this advisable.

- Measures to address specific shortcomings appear in Section 0.

At European level, key policy objectives should include:

- Ensuring that existing policy instruments are effective (see Section 6.1.5).

- 'Joining up' e-government implementations so as to achieve realistically realisable economies of scope and scale, and more effectively to meet the needs of citizens requiring multiple services.

- Facilitation of data interchange among e-government services and applications so as to enable cross border interchange of information where appropriate (and with due respect to individual privacy and national sovereignty).

- Coordinating research and standardisation policy so as to avoid needless duplication and waste.

Having considered various broad policy constellations, we think that a more activist European role is called for, but within bounds. Some functions could be centralised, while others should remain at Member State level but with increased focus on achieving scale economies through cloud-enabled software re-use, together with cross-border interoperability. Excessive centralisation is not the answer here in our view. A balance must be struck, but a different balance than we experience today.

Our overall preferred policy approach would thus entail not only sharing and promotion of best practices, but also a much more engaged and comprehensive implementation of a modernised European Interoperability Strategy, updated to reflect newer concepts including cloud services, big data, and ubiquity in general. Two or three large scale demonstration projects (such as e-Customs and e-VAT) would be *successfully* implemented in multiple Member States.

Specific measures

If one considers the individual programmes considered in Section 6.1.5, our assessment is that they are all under-performing in one way or another.

- Some, like e-VAT and e-Customs, are experiencing interminable delays in implementation.

- Some are experiencing 'paralysis through analysis'.

- Several enjoy an apparently promising Large Scale Pilot under the CIP, but never progress to large scale production deployment.

- A few of the very best make some progress, albeit at glacial speed.

Our assessment is that these are genuine and complicated problems. Some of them differ from one domain to the next, but we anticipate that some issues (and their potential resolution) will be common across different domains. We conclude that there is no substitute for analysing them in detail.

This will be hard work, but there is no getting around case by case analysis.

Each individual programme will tend to be subject to individual Evaluation, but these Evaluations tend to be undertaken in isolation from one another, and moreover have a tendency to be overly charitable to ongoing problems.

At the risk of promoting more 'paralysis by analysis', we think that a necessary first step is to acknowledge frankly that the entire area of interoperable cross-border e-government services, whether ubiquitous or not, is stuck in the mud.

Recommendation 3. Acknowledge systemic failure rather than isolated problems.

A frank acknowledgment is needed that overall progress on the deployment of interoperable cross-border e-government services is making scant progress. This must be addressed as a system failure, not as a series of isolated problems.

A coordinated approach to understanding the underlying problems is needs; however, it is probably not practical, in our view, to launch a mammoth study to consider all of these different activities together. Properly understanding the problems in any of these domains requires specialised domain-specific knowledge. No expert, or single company, is likely to have full expertise in every area; moreover, a single mammoth study increases the risks of a failed study in comparison with several parallel studies, coordinated in delivery dates and objectives.

We believe that a group of studies, coordinated in terms of scope, delivery dates and general terms of reference, is more likely to yield useful results.

Recommendation 4. Analyse the individual stalled initiatives in a coordinated way.

We see the need for a coordinated barrage of studies to simultaneously understand, in several prominent domains, what is required to accelerate progress on achieving interoperable cross-border e-government services.

The substantial de-funding of the Connecting Europe Facility has not only affected broadband deployment, but has also had the unfortunate and perhaps unintended consequence of undermining efforts to accelerate the move to interoperable cross-border e-government services.

Recommendation 5. Find a way to fund progress.

Explore alternative means to fund interoperable cross-border e-government services.

It is likely that each ongoing activity will require a different constellation of corrective measures. In the case of eHealth, our investigation has necessarily been far more brief than is warranted, but we have the strong sense that existing efforts are in the right direction but are insufficiently ambitious in terms of concrete steps and even concrete planning.

Recommendation 6. For eHealth, concrete planning with operational deliverables is needed.

The already committed deliverables of the Commission and the eHealth Network for 2014 and 2015 should be expanded to include concrete planning with specific dates and commitments to eventual operational systems (subject to funding by the European institutions).

We identified a number of additional areas as being good candidates for a more activist policy. Detailed evaluation of these areas is well outside the scope of this study, but we would nonetheless venture some tentative recommendations as a starting point for discussion.

Recommendation 7. For e-ID, authorisation, authentication, and the EIF overall, concrete planning with a focus on operational middleware and interoperable APIs and protocols is needed.

For e-ID, authorisation, authentication, and the overall *European Interoperability Framework (EIF)*, planning to 2015 and beyond needs to go beyond dialogue and consciousness-raising.

Planning needs to include operational deliverables, not just discussion papers. If planning is not yet possible, then a plan for a plan is needed, and it must reflect a sufficient sense of urgency.

The focus today should in our view be on *functional interoperable middleware* – actual interoperable, reusable software code with well-defined *Application Program Interfaces (APIs)*, and with defined communication protocol interfaces between systems where appropriate.

In our view, many of the requirements for cross-border interoperability are already clear, and for that matter some appear to have been fairly clear for years. Debate and discussion among the Member States play a vital and necessary role, but they cannot go on interminably, and will not necessarily add further clarity in the absence of operational experience with cross-border systems.

At some point, actions on the ground are needed.

The requirements for authentication and authorisation using electronic identification, for example, are reasonably familiar from commercial contexts, and in the context of e-Health there is a clear and agreed high level statement of requirements[317]. In terms of protocols for communications between systems (including of course cross border communications) in

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[317] eHGI (2012) 'Conclusions on 'eID EU Governance for eHealth Services'', apparently May.

regard to authentication and authorisation, the IETF DIAMETER protocol[318] is an obvious candidate. There will be a requirement for further flanking actions related to the use of authentication and authorisation in specific contexts, but so far as we can so there is no serious impediment today to starting detailed work on suitable middleware and Application Program Interfaces (APIs), drawing on commercial solutions.

Other e-government middleware could be considered to support other processing activities that are likely to be common to multiple e-government applications. For instance, middleware support might be warranted for ePayment and other online transaction services that would make it easier to comply with applicable tax, reporting and financial service regulation requirements.

Recommendation 8. Require Member States to use EIF modules where appropriate.

Member States should be required to consider the use of reusable EIF modules wherever appropriate once the modules are available and sufficiently reliable.

In the absence of an obligation at European level, Member States are likely to make only limited use of reusable, interoperable EIF middleware modules. The benefits of interoperability are far greater to Europe as a whole than to individual Member States. This is analogous to a public goods problem where societal benefits are substantially greater than individual benefits; consequently, it is unlikely to be solved without action at European level.

Recommendation 9. Put e-VAT and e-Customs efforts back on track.

For e-Customs and e-VAT, the delayed implementation programmes need to be analysed, and need to be either corrected or replaced promptly.

Other policy areas pursued on the European level would merit from a close examination of benefits that could be derived from ubiquitous solutions since such solutions require and lead to better coordination of e-government services, as well as to an improved and unfragmented access to them. This is reflected in expectations of EU citizens and businesses in such areas as emergency services, employment, vocational training and education, public procurement, registers, etc.

Recommendation 10. Investigate costs and benefits of ubiquitous development in other policy areas.

A detailed analysis of costs and benefits needs to be performed on a case by case basis for other policy areas that may be amenable for coordinated action on the European level.

As we saw in Section 3.4, the Netherlands analysed issues of re-use of commercial ubiquitous and/or cloud services applications in some detail, and concluded that this inappropriate for many e-government applications; however, commercial services should in our view be considered where application requirements permit, and especially in cases where the application exists primarily to make public data available to the public.

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[318] Fajardo, V. et al. (2012) 'Diameter Base Protocol', Internet Engineering Task Force (IETF) Request for Comments 6733, October.

Recommendation 11. Consider the use of commercial ubiquitous solutions where application requirements permit.

Member States should consider commercial ubiquitous application solutions such as cloud services on a case by case basis for e-government services, even though their scope is likely be limited. Concerns over privacy, security, and uncertainty over the country in which data will be housed and consequently over the legal jurisdiction to which the data is subject must be considered based on the requirements and sensitivity of the specific e-government application. In many cases, cloud services operated by public administrations would be preferable to public cloud services.

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ANNEX 1: ASSESSMENT OF UBIQUITOUS DEVELOPMENTS

Each assessment is to be interpreted as a judgement vis-à-vis a (non-specified) counter-factual world in which the specific initiative does not exist.

Explanation of the scores in the tables:

0 = no change;

+ = better;

++ = much better;

▬ = worse;

▬▬ = much worse; and

n.a. = not applicable

Table 24:   Assessment of ubiquitous approaches: South Korea

	u-City (Busan, Songdo)	e-procurement (KONEPSO)	Broadband convergence Network
Main stakeholders	Central government, local government, platform providers, service providers, technology providers	Central government	Central government
Main sources of funding	Tax funds, commercial funding	Tax funding	Tax funding
Effectiveness (regarding objectives) Primary effects of product /service/application/solutions on businesses and governmental authorities Primary effects of product /service/application/solu-tions on the demand side (private/business users) Potential macro effects	**+** - While the level of wiredness and access to (mobile) broadband are impressive, it is difficult to determine the actual effectiveness in terms of services - Commercial revenues from services are being made; fewer revenues from government services	**++** - Creating a portal and single market for (nearly) all government procurement	**++** - Meeting the objective of making Korea a highly connected and technology advanced country - Access to internet in rural areas and for those that are less technological savvy - Economic growth among larger businesses and conglomerates - To a lesser extent serving the needs of citizens - Serving societal needs such as surveillance
Efficiency (regarding implementation) Communication vis-à-vis the envisaged stakeholders, measures to raise attractiveness, high profile Costs (financial and other), approaches to avoid gaps/duplications/in-consistencies	**+** - Top-down implementation, in some cases 'from scratch' (Songdo)	**++** - Economies of scale, it has become a very large market	**++** - Strong top-down implementation has led to a large degree of adoption

	u-City (Busan, Songdo)	e-procurement (KONEPSO)	Broadband convergence Network
Interrelationship between planning and implementation, optimal steering			
Coherence	**O** - Learning effect through best practices, rather than a coherent framework across different cities	**++** **-** Creation of a single portal and market for all government procurement	**++** - Integration of broadband networks and sensor technology
Degree of embeddedness into wider policy context	**++**	**++**	
Accomodation of preferences (national, regional, and local)	**++** **-** u-Cities serve the specific purposes of the local communities - PPP's	**+**	**+**
Promotion of free movement of goods, capital, services and people	**n.a.**	**++** - More effective e-procurement	**++** - Basic infrastructure for economic activity, services, gaming etc.
Overall assessment	The u-Cities are very well 'wired' and connected and offer a wide range of commercial and public services. Also shows a high degree of surveillance state features	An effective portal/market for e-procurement of all government agencies has emerged	Large degree of the use of sensor technology and the integration into the broadband infrastructure has led to a very high level of internet adoption. Does not always serve citizens best, but also promotes the interests of large industrial conglomerates

Table 25:   Assessment of ubiquitous approaches: US

	Open Government Initiative	**Healthcare.gov**	**USA.gov**	**Business.usa. gov**
Main stakeholders	- Federal Government, also state and local governments - Public authories	- Federal Government, - Also insurance companies, businesses, esp. small (less than 50 employees)	- Federal Governme nt and all governme nt authorities on federal/st ate/local level	- Federal Governmen t - Businesses and their organisatio ns
Main sources of funding	- Taxes, - e-Service providers make own investments regarding developments of services /application provided via the many thematic web platforms	- Taxes	- Taxes,	- Taxes

	Open Government Initiative	Healthcare.gov	USA.gov	Business.usa.gov
Effectiveness (regarding objectives) Primary effects of product /service/application/solu-tions on businesses and governmental authorities Primary effects of product /service/application/solu-tions on the demand side (private/business users) Potential macro effects	**++** - Political and organisational basis for the introduction of a variety of e-services - Greater governmental transparency, participation for citizens and businesses, collaboration within government authorities and with the public and with businesses	**++** - Overview on all existing e-health services, - Main focus on finding affordable health insurance - Lower transaction costs on the patients, employees and employers side - Enhance competition between health insurance companies - Encouraging small business to offer health insurance schemes	**++** - Lowering transactions costs /information costs both on government and demand side - Transparency by bundling almost all existing information websites, databases, e-services etc. via one central website	**++** - Reduces information costs by creating a „one-stop" platform for information - Cost savings on consultion costs as platform offers interactive elements - Currentness of data as well as - Greater transparency of legal frame-works, financing options, invest-ment opportunities and hiring conditions etc.

	Open Government Initiative	Healthcare.gov	USA.gov	Business.usa. gov
Efficiency (regarding implementation) Communication vis-à-vis the envisaged stakeholders, measures to raise attractive- ness, high profile Costs (financial and other), approaches to avoid gaps/duplicatio ns/inconsistenc ies Interrelationshi p between planning and implementation , optimal steering	**++** - Coordinated actions by creating central platforms and creating legal framework - Low key top- down approach in creating central meta databases and websites avoids duplication of resource utilisation and inconsistencies - Open to all stakeholders who want to link to programme	**++** - Standardised information base for of all kinds of e- health services - Open platform - Central operation of the platform but open to all health institutions on Federal and State level	**++** - Open to everyone who would add their services by linking to the website (appropria te thematic connection has to be proved)	**++** - Close cooperation between government initiative and business organisatio ns, - Feedback opportunitie s for businesses to improve platform

	Open Government Initiative	Healthcare.gov	USA.gov	Business.usa.gov
Coherence	++	++	++	++
Degree of embeddedness into wider policy context Accomodation of preferences (national, regional, and local) Promotion of free movement of goods, capital, services and people	- Embedded-ness in an overall economic policy context and aims of modernising and improving efficiency of government actions on federal/state/local level - Usage of information is unlimited - Services need registration and sometimes identification (but no central e-ID)	- Embedded into e-government initiative - Platform promotes transparency of health system	- Embedded into Open Government Initiative - Promotes free movement of goods, capital, services and people	- Embedded into Open Government Initiative - Promotes free movement of goods, capital, services and people
Overall assessment	- Bundles and coordinations losely hundreds of information and transaction services on all levels, for all regions and (in the broadest sense) e-government topics	- High transparency for all who are involved in health system - Fostering competition by creating a marketplace for health insurances - Full service will start from October 2013	- High transparency and openness towards all kinds of additional e-services	- Cost and time benefits for business users - Potential reduction of bureaucracy and costs on government level

Table 26:   Assessment of ubiquitous approaches: Canada

PE 507.481	Canadian Digital Economy Strategy (DES)	Federating Identity	Service Ontario	Shared Services Centres	e-health record system
Main stakeholders involved	Federal government, ICT providers association	Federal government, service providers	Provincial government	Federal and other jurisdictions	Federal Ministry, health care service providers
Main sources of funding	To be decided	In planning, funded by taxes	Taxes	Private investments in service provision and PPP play a major role	Taxes
Effectiveness (regarding objectives) Primary effects of product/service /application/solution on businesses and governmental authorities Primary effects of product/service /application/solutions on the demand side (private/business users) Potential macro effects	**n.a.** (In planning)	**+** - New lean processes in and between economic entities - Lowering of tran-sactions costs	**++** - Lowering transaction costs for local businesses and residents	**++** - Induce new e-government services - economies of scale, - More costeffectiveness for government authorities - Strengh-thening domestic industry	**+** - Cost efficient provision of better medical treat-ment through information, - Impact on sector efficiency

	Canadian Digital Economy Strategy (DES)	Federating Identity	Service Ontario	Shared Services Centres	e-health record system
Efficiency (regarding implementation) Communication vis-à-vis the envisaged stakeholders, measures to raise attractiveness, high profile Costs (financial and other), approaches to avoid gaps/ duplications/inconsist encies Interrelationship between planning and implementation, optimal steering	**n.a.** (Too premature, no policy paper available yet)	**++** - First planning milestones achieved but relatively low activities reg. awareness and high profile	**++** - Successful implemen ted and promoted	**++** - PPP enables economies of scale - Use of technical progress ("cloud")	**+** - Few observable measures to meed obstacles reg. usage in doctors surgeries
Coherence	**0** - Standardi-sation and coherence with international developments play a minor role	**0**	**0**	**0**	**0**
Degree of embeddedness into wider policy context	**—** **-** Will be embedded in overall economic policy	**—** - Embedded in overall requirements for signature and identification	**—** - Singular, regional measure	**—** - Singular measure for enable more efficient e-government services	**—** - Sector specific

	Canadian Digital Economy Strategy (DES)	Federating Identity	Service Ontario	Shared Services Centres	e-health record system
Accommodation of national, regional and local preferences	**n.a.** - Too premature	**+** - Action for integration of all levels by forming committees etc.	**+** - Regional and local require-ments are met (e.g. by alternativ e kiosk system)	**n.a.**	**n.a.**
Promotion of free movement of goods, capital, services and people	**+** - Could have overall effects	**+** -Services, people	**+** - Services	**+** - Services	**+** - Services,
Overall assessment	seems to have a low priority within the Government, plan lags behind	in interna-tional comparison, not a forerunner in this field of application, degree of ubiquity of services remains open at the moment	Success-sful e-service, renown as highly accep-ted tool by busi-ness and private users, alter-native forms of usage, certain degree of ubiquity	high potential of cost effectiveness and technical moderni-sation of e-services between government and business/ private users	lacks acceptanc e in the health care system, approach seems to be state-of-the-art, services might enhance ubiquity once they are wider spread

Table 27:   Assessment of ubiquitous approaches: Japan

	Smart cities Initiative	e-Learning initiative
Main stakeholders involved	Government, large conglomerates; local administration;	Federal government, education providers, population at large service providers in particular mobile
Sources of funding	Mix of private and public	Government funds initiatives for public schools; private sector runs own initiatives and pilots
Effectiveness (regarding objectives) Effects of product/service/application/solu-tions on businesses and governmental authorities Effects of product/service/application/solu-tions on the demand side (private/business users) Potential macro effects	Potential effects (projects still in pilot phase) - Position national champions as drivers in gov't financed projects, - Strengthen the export capacity of Japanese companies - Environmental protection (strong focus on smart grids) - R&D	**-** Past initiatives focusing on access have not been successful in implementing eLearning - Creation of new apps and services, in particular in mobile learning **-** Possible efficiencies from expanding distance higher education - lowering transaction costs/ surplus from savings on educational costs
Efficiency (regarding implementation) Communication vis-a-vis the envisaged stakeholders Costs (financial and other), approaches to avoid gaps/duplications/inconsistencies Interrelationship between planning and implementation, optimal steering	**0** Top -down approach	**0** Top-down approach to govt policy Large-scale pilots in public schools; focus on access to technology and only recently incoprporates elements of teacher education; No evidence of consultation with private sector companies sponsoring private universities to leverage efficiencies of scale and scope
Coherence	**0** - Standardisation and coherence with international developments play a minor role; focus more on competitiveness and energy independence	**0**

	Smart cities Initiative	e-Learning initiative
Degree of embeddedness into wider policy context	++	+
Accommodation of national, regional and local preferences	+ In particular disaster preparedness angle in the wake of Fukushima disaster and earthquake	0 Program struggles to translate national trends of high technology use into effective eLearning outcomes
Promotion of free movement of goods, capital, services and people	0	0
Overall assessment	+ **(Projects still in pilot phase)**	— Program struggles to translate national trends of high technology use into effective eLearning outcomes

Table 28: Assessment of ubiquitous approaches: Estonia

	e-Estonia Initiative	X-Road	e-Identity	e-Taxation
Main stakeholders	Government, service providers, ICT industry	Service providers, government, citizens	Service providers	Government, business and private users (tax payers)
Sources of funding	- Funded by taxes, EU-funding, - Private investments in certain services	- Funded by taxes, EU-funding, - Open to all kinds of service providers´s investments	- Funded by taxes, EU-funding - Service providers (esp. banking sector)	- Unded by taxes, EU-funding
Effectiveness (regarding objectives) Primary effects of product/service/application/solutions on businesses and governmental authorities Primary effects of product/service/application/solutions on the demand side (private/business users) Potential macro effects	++ - Governmental transparency	++ - Induced creation of new products/services, - Strengthening domestic industry	++ - Lowering transactions costs - Safer ICT based transactions - Esp. effects on pricing policy in banking sector	++ - Affects productivity - Economies of scale, - Cost benefits for tax authority and businesses

	e-Estonia Initiative	X-Road	e-Identity	e-Taxation
Efficiency (regarding implementation) / Communication vis-à-vis the envisaged stakeholders, measures to raise attractiveness, high profile / Costs (financial and other), approaches to avoid gaps/duplications/inconsistencies / Interrelationship between planning and implementation, optimal steering	**++** - Strongly coordinated action - Top-down approach avoids duplication and inconsistencies	**++** - Open platform enables economies of scope and learning curve effects while implementing	**++** - Early cooperation with bank sector ensured critical mass of e-ID use	**++** - New e-service could profit from positive experiences with e-ID, facilitates communication with stakeholders
Coherence	**+** Coherent with EU overall requirements where necessary	**n.a.**	**++** Coherence with EU/international policy context	**++** Coherence with national tax requirements
Accommodation of national, regional and local preferences	**0** After foundation of new state of Estonia chance to start partially "from scratch"	**n.a.**	**n.a.**	**na.**
Promotion of free movement of goods, capital, services and people	**0** Usage is limited to geographical area of Estonia resp. bearer of e-ID Card	**0** Services	**0** Services	**+** Success in exporting solutions „exporting ideas": e-Estonia as distinguished example of e-government

	e-Estonia Initiative	X-Road	e-Identity	e-Taxation
Interrelationship between planning and implementation, optimal steering	**++** Close cooperation between all stakeholders	**++** Close cooperation between all stakeholders, central running of the platform but open to new service entrants	**++** Flanked by training and qualification schemes for internet use	**++** Close cooperation between all stakeholders
Overall assessment	after foundation of new state of Estonia chance to start partially "from scratch" evaluations show severe cost reductions	early "cloud" approch and technical and organisational openness seems to be key to the overall success data protection issues were addressed from the start	forerunner in Europe in the field of digital signature and identity, high acceptance and usage due to e.g. datat protection measures and pricing policy	high service acceptance profits from experience with e-ID and X-Road and from cost and time benefits for all users

Table 29:   Assessment of ubiquitous approaches: UK

	G-Cloud	NEPP e-Procurement
Main stakeholders involved	Government (Home Office[319], Ministry of Justice), ICT providers (esp. SMEs)	Central Government (Government Procurement Service (Cabinet Office) and Departmental Procurement offices); lesser stake of local/regional government; suppliers including traditional 'strategic' large suppliers and SMEs (esp. for non-ICT areas)
Sources of funding	Reprogramming existing ICT budgets (currently suspended under ICT moratorium)	Departmental and Local Authority procurement budgets
Effectiveness (regarding objectives) Effects of product/service/application/solutions on businesses and governmental authorities Effects of product/service/application/solutions on the demand side (private/business users) Potential macro effects	**—** Limited by political and economic uncertainty, excessive technology focus, lack of clear intervention logic. - Full buying power of government in implementing G-Cloud has not been exploited. Potential is recognised, but Cabinet Office has not recruited or required a critical mass of government bodies - ¬ Despite endorsement in 2010 ICT Strategy, progress has been slow320.	**++** - High levels of adoption and uptake - Strong and documented savings across many (esp. central) government procurement activities - Macro effects: procurement has been a powerful part of GDP; NEPP can improve its cost-effectiveness,
Efficiency (regarding implementation) Communication vis-a-vis the envisaged stakeholders Costs (financial and other), approaches to avoid gaps/duplications/inconsistencies Interrelationship between planning and implementation, optimal steering	**—** - Lack of coordination - Limited value of contracts placed - Suspension of new ICT initiatives in conjunction with austerity	**+/-** - Economies of scale - Improved efficiency insulates value generation against government expenditure reductions - Potential rebound effect if this encourages further cuts - Effects hard to separate from spending plans.

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[319] National Audit Office (2013b) 'The impact of government's ICT savings initiatives' HC887, London: The Stationery Office.

[320] National Audit Office (2011b) 'Information and Communications Technology in government: Landscape Review' HC757, London: The Stationery Office.

	G-Cloud	NEPP e-Procurement
Coherence	**+**	**0**
Degree of embeddedness into wider policy context	- Integrated with Transformational government, Data Centre rationalisation, Government App store and shared services programmes + Cross government initiative coordinated by two 'spending' ministries and with dedicated CIO delivery board involvement.	- e-Enablement strategy underpins government procurement reform - It contributes to attempts to centralise procurement, and is regarded as the most coherent attempt to date[321], which has already produced substantial savings and encouraged action by spending Deartments to improve SME participation - There remain weaknesses in setting targhets and in implementation
Accommodation of national, regional and local preferences	**0** - National initiative	**+** - National initiative - inadequate inter-agency accountability, linked to weaknesses in common information system - departments not sufficiently involved in technical specifications, so some systems incompatible with departmental software.
Promotion of free movement of goods, capital, services and people	**0** - Should improve shared facility use – hence migration to most efficient destination; Emphasis on SME involvement may militate in favour of local content, but use of OJEU process should enable cross-border procurement	**+** - In principle, should open up public procurement markets No concrete evidence to date

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[321] National Audit Office (2013a) 'Improving government procurement' HC 996, London: The Stationery Office.

	G-Cloud	NEPP e-Procurement
Overall assessment	One of the earliest, most sophisticated and best-integrated 'national cloud strategies' but damaged by slow start, limited integration of ICT and non-ICT stakeholders and shift in objectives (from improving the coherence and effectiveness of government ICT to minimising ICT costs; planned savings levels increased to £1.6B, but these were abandoned when spending cuts prevented new initiatives. Currently unclear whether different stakeholders' portions will continue.	Repeated efforts have been made to reform procurement and to introduce e-procurement. NEPP and its successor initiatives (esp. the e-enablement strategy that accompanies the procurement reform programme) provide a comprehensive suite of tools[322] whose adoption is driven by increasingly stringent budget controls. All the initiatives have been implemented and are well-regarded, esp. by smaller agencies. - There remain problems with consistency and departmental involvement, and with quality and utility of information.

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[322] Contracts Finder (all contract opportunities > 10.000 pound) ; eMarket Place (simple bidding for procurements < 100.000 pound and central hosting of contracts and catalogues) ; eSourcing (procurement management tool for tool for procurements > 100.000 pound, including e-Auctions and contract management); Spend analysis (monthly reporting on departmental procurement expenditure by category and supplier); and Government Procurement Portal (single website to direct suppliers and procurement officers to tools).

Table 30:   Assessment of ubiquitous approaches: The Netherlands

	The Digital Agenda	i-NUP	Rijkscloud	Home Care SenseNet	National electronic patient record
Main stakeholders involved (in implementation)	National and local government, non-profit, businesses (incl. SMEs)	National and local government	National government, local government, businesses	Healthcare service providers, patients, government, businesses	National government, health care service providers, businesses
Sources of funding	Public and private investments.	National, local government, specific government agencies	National government	private investments in service provision and PPP play a major role	Public and private investments
Estimations of effectiveness (regarding objectives) Effects of product/service / application solu-tions on businesses and governmental authorities Effects of product/service / application/solu-tions on the demand side (private/business users) Potential macro effects	The digital agenda focuses on the establishing of key building blocks for e.g. smart businesses, fast and open infrastructures and internet safety **++** - Open to private and business users - Lowering transaction costs - Induced effects regarding creation of new products, services - Citizens feeling safer online - Sector and overall productivity of the Dutch economy	**+** - The NUP focusses on the improvement of government services to citizens and businesses - Administrative burden reduction - Lowering transaction costs - Induced new processes between governmental organisations	**+** - Increased accessibility of government data for end-users - Lowever (e.g. maintancence) costs - Developed and exploited within a central government body	**++** - Induced creation of new products and services - Lowering transaction costs - Improved quality of life - Improved care and greater safety - Patient empowerment - Increased productivity healthcare sector - Feeling safer	**+** - Induced new processes between businesses and between businesses and state - Induced effects regarding economies of scale and productivity - Lowering transaction costs - Better care to patients

	The Digital Agenda	**i-NUP**	**Rijkscloud**	**Home Care SenseNet**	**National electronic patient record**
Estimations of efficiency (regarding implementation) Communication vis-a-vis the envisaged stakeholders Costs (financial and other), approaches to avoid gaps/duplications/ inconsistencies Interrelationship between planning and implementation, optimal steering	No evaluations available on efficiency of implementation, maybe interview to identify problems in the implementation phase? Perhaps lack of coordination (between ministries)	No evaluations available on efficiency of implementation, maybe interview to identify problems in the implementation phase? Perhaps lack of coordination (between ministries		Limited to regional partners involved	Implementation problems due to contradictory interests and concerns of partners involved (e.g. on privacy)
Coherence Degree of embeddedness into wider policy context	**++** - In line with the European Digital Agenda - Cloud policy in line with the European cloud strategy - Support of Pan-European Copyright licenses	**+** - The i-NUP is in line with the objectives of the EU eGovernment Actionplan (e.g. concept 'Antwoord' and accessibility guidelines)	**+** - Cloud policy in line with the European cloud strategy	**0**	**+** - Cross border availability of patient records as a possibility
Accommodation of national, regional and local preferences	National, regional and local government	National, regional and local government	National, regional and local government	Limited to regional partners involved	Sector specific
Promotion of free movement of goods, capital, services and people	**+** Support of Pan-European Copyright licenses (free movement of services)	**0**	**0**	**0**	**+** Promotion of free movement of people within Europe
Overall assess	**++**	**+**	**0/+**	**+**	**+**

Table 31:   Assessment of ubiquitous approaches: Germany

	DE-Mail	e-ID	Job Board („e-Jobs")	Smart City Friedrichshafen	
Main stakeholders	Government authorities service providers businesses and citizens	Government authorities online service providers	Federal employment agency employers and job seekers	Deutsche Telekom AG, local government/ town council, regional service providers from different sectors and ICT industry	Main stakeholders
Sources of funding	Taxes	Taxes, registration fees, service providers who offer secure services	Taxes (budget of federal employment agency)	- Funded by Deutsche Telekom AG - PPP agreement with town of Friedrichshafen - Private investments in certain services - Involvement of different institutions	Sources of funding

	DE-Mail	**e-ID**	**Job Board („e-Jobs")**	**Smart City Friedrichs-hafen**	
Effectiveness (regarding objectives)	**++**	**++**	**++**	**++**	**++**
Primary effects of product/service /application/sol u-tions on businesses and governmental authorities	More efficient processes within and between government authorities and with citizens/busine sses	Lowering transaction costs on all government levels	More cost effectiveness for employment agency	- Induced creation of new products/ services,	More efficient processes within and between government authorities and with citizens/busi nesses
Primary effects of product/service /application/sol u-tions on the demand side (private/busines s users)	lowering transaction costs	more secure identification for online services	lowering information and transaction costs for businesses and job seekers	- Strengthen ing domestic industry	lowering transaction costs
Potential macro effects		induce new services	international offerings	- Experience s in different kinds of new services like telemedcin e, telelearnin g, smart meter, smart home, secure e-mail	

	DE-Mail	e-ID	Job Board („e-Jobs")	Smart City Friedrichs-hafen	
Efficiency (regarding implement-tation) Communi-cation vis-à-vis the envisaged stakeholders, measures to raise attractiveness, high profile Costs (financial and other), approaches to avoid gaps/duplicati ons/inconsis-tencies Interrelation-ship between planning and implementa-tion, optimal steering	n.a. Too premature (e-government law adopted June 2013)	+ Legally implemented and promoted technical infrastructure established reaching critical mass of users will take some more time	+ Successful implemented and promoted since the 1990s, use of technical progress (search engines, mobile app, employers registration tools)	++ - Coordinate d action by Deutsche Telekom	Communi-cation vis-à-vis the envisaged stakeholders , measures to raise attractive-ness, high profile cooperative approach enables to get qualitative and quantitative data about implementati on opportunities and barriers testbed enables learning curve effects while implement-ting scientific evaluation shows fields of
					transferabili ty to a national level - High visibility seems to contribute to accep-tance of innvative e-services, not only on a local but also on a national level

	DE-Mail	e-ID	Job Board („e-Jobs")	Smart City Friedrichs-hafen	
Coherence	**++** Coherence with EU wide regulations	**++** Coherence with EU wide regulations	**++** Coherence with EU wide regulations	**+** - Tested services coherent with EU overall requirements, e.g. in smart metering and secure e-mail project - Usage is limited to geographical area of T-City but successful transfer to a national level (secure e-mail, telelearning, kindergarten online)	**++** Coherence with EU wide regulations
Degree of embeddedness into wider policy context	**++** Embededded in overall e-government strategy	**++** Embededded in overall e-government strategy	**n.a.**	**n.a.**	**++** Embededded in overall e-government strategy
Accommodation of national, regional and local preferences	**n.a.**	**n.a.**	**n.a.** Nationwide system, accessable from internet for everyone	**n.a.**	**n.a.**

	DE-Mail	e-ID	Job Board („e-Jobs")	Smart City Friedrichs-hafen	
Promotion of free movement of goods, capital, services and people	**++** Services	**++** Services	**++** Multilingual system, registration for employers and use for job seekers not limited Enhances free movement of people and capital	**n.a.**	Promotion of free movement of goods, capital, services and people
Overall assessment	**++** Legal and organisational basis successfully build but too early to assess practical usage	**+** Legal and organisational basis successfully build but to achive critical mass of users will take some more years	**++** Widely used e-service in the field of employment	**+** - Regional new e-services show advan-tages for local residents, businesses and local govern-ment authorities	

NOTES

NOTES

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